

MOTOR AGE

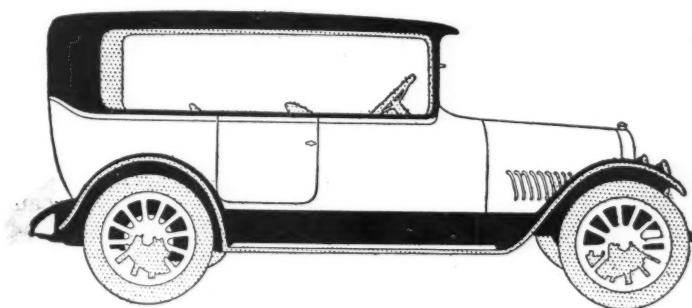
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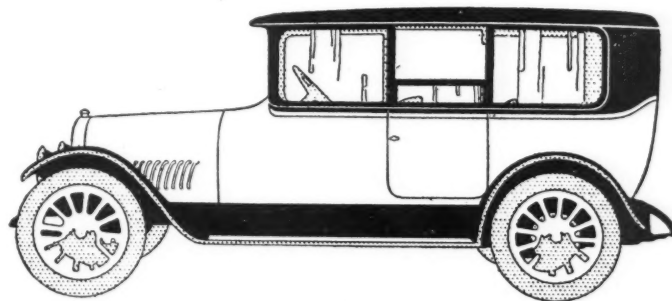
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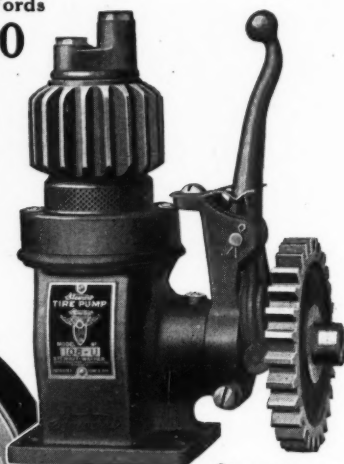
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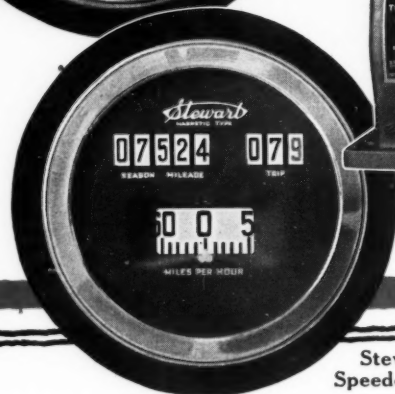
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Stewart
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Warner
Auto-Meter

\$50



The Stewart-Warner
Speedometer Corporation
Chicago, Illinois, U.S.A.

MOTOR AGE

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ANNOUNCEMENT

The feature of Motor Age for next week will be
"When This Circus Comes to Town." In it you will
learn what the small boy of today will be racing off to
meet when the new circus, the motorized circus, is
coming into town.

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 sometimes *it's* the territory
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 when an entire State like
Louisiana

shows 288.5% increase in 1916
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 the advantage of having
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It pays to be a *Studebaker* dealer



The Buick ambulance working in a still-disputed village on the Italian front

Efficiency of Ambulance Service Told by Driver

In Two Parts—Part I

EDITOR'S NOTE—W. F. Bradley, special *Motor Age* representative in Europe, was for four months ending with Jan. 12, engaged in the Italian Ambulance Service on the Italian-Austrian front. During practically all of this time he was doing regular ambulance duty in front of the heavy Italian artillery, or between the Italian artillery and the trenches. For some time he was operating out of Gorizia, which was taken by the Italians. It is questionable if any writer has had better opportunity of first-hand study of ambulance service than Mr. Bradley. Pictures reproduced herewith have been approved by the Italian censor

FOUR American-built ambulances stood in the courtyard of a one-time seminary on the suburbs of a one-time Austrian city. Each of the windows of the main building was solidly boarded on the outside and substantially sand bagged on the inside; only the operating room on the ground floor received natural light and boasted an improvised acetylene equipment made out of motor car headlights. In the rest of the building men moved about, with the aid of feeble candle light, and did not appear to find it any disadvantage. The main building had a huge red cross painted on its roof and a red cross banner, at least 40 ft. square, attached to each of its end walls. A smaller building, which might have been the principal's residence in peace days, had no such distinctive signs, for its roof had gone and its still substantial walls were blackened by fire.

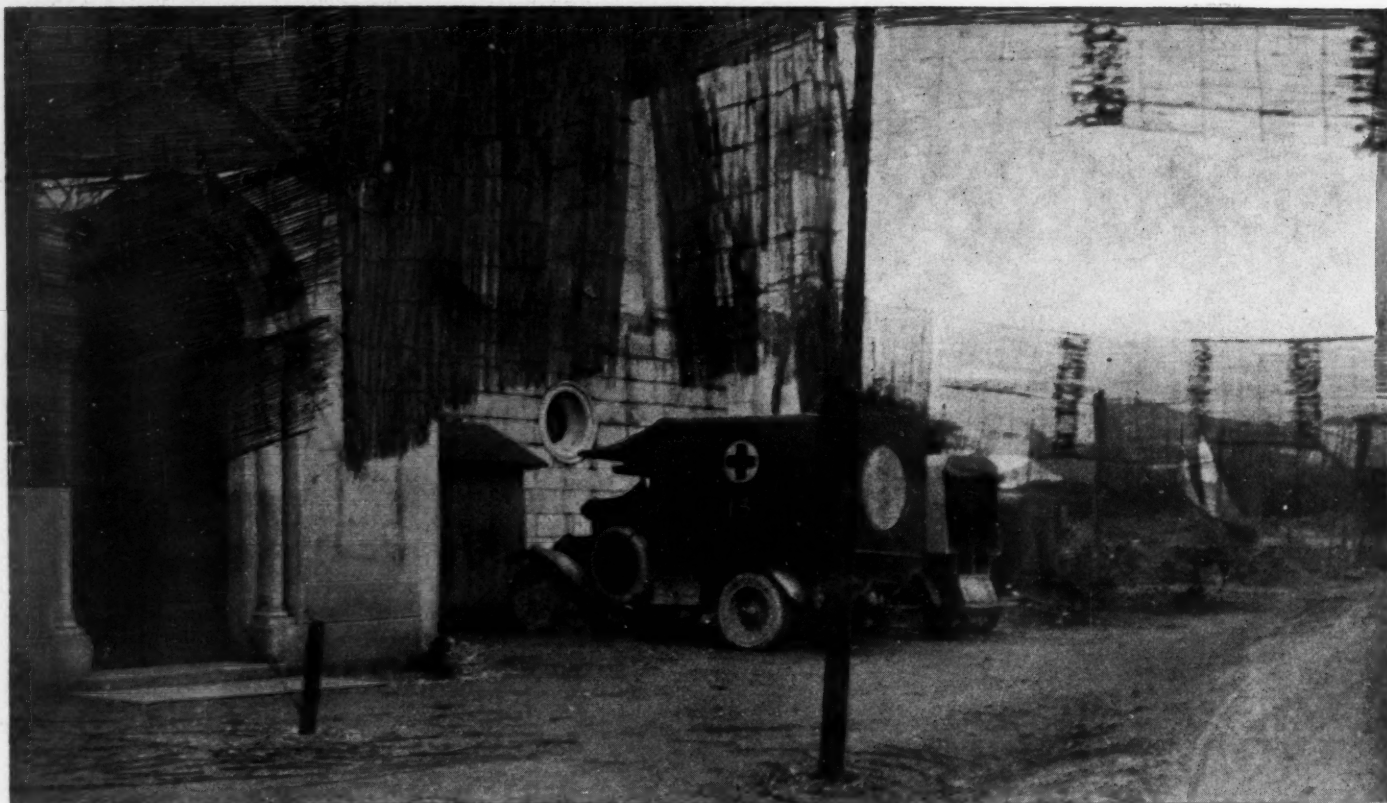
No battle was in progress, but the artillery was active. Enemy shells went hissing over the seminary and bursting with a deafening report in the town just beyond, but the Italian guns were not inactive. A battery of 75's, probably a couple of hundred yards in the rear, came into action with that sharp angry bark not unlike the exhaust of those high-compression single-cylinder racing motors France used to build a few years ago.

How Wounded Are Moved

The wounded were brought out on stretchers, on the backs of other men, or hobbled painfully under their own power. As each car was filled up with either a load of four stretchers or ten sitters, each of the wounded having a tag attached to some part of his clothing, the driver was given

a list of the men in his charge, and moved off, to run for a distance of 5 or 6 miles over the shell-swept roads.

Although so near the front, this was not the first stage in the transportation of wounded men from the firing line to hospital and convalescent home. About a mile ahead of that seminary were the Italian trenches, and somewhere in the vicinity of those trenches was a cave hewn out of the rock, whitewashed, and fitted with a table and a couple of benches. It was here that the men wounded while in the firing line received their first medical attention, and it was from this point that wounded men first came in contact with motor ambulances. This first stage is field dressing station to divisional headquarters and dressing station, but war conditions rarely make it possible for a regular and continuous motor ambulance service to be maintained on Stage No. 1. Sometimes there



An open-air ambulance garage outside a one-time Austrian church.

This place was often under shell fire and drivers were wounded while working on their cars

are no roads; sometimes the tracks are in such a condition that no wheeled traffic can pass over them; sometimes the country is so exposed that for any person to appear would be to call forth a shower of bullets or a deluge of shells.

Thus, there is no definite rule as to how men shall be removed from the field dressing station to divisional headquarters. In some cases slightly wounded and sick men are sent back on foot; by the aid of communication trenches extending far to the rear they are able to do this with little danger. In other cases the motor ambulances move forward under darkness, load up silently and creep away with as little noise as possible. One particular case may be mentioned where the cars had to travel down a mountain side, cross the river and pick up wounded men at an advanced post only a few yards from the enemy's lines. To make the task more difficult, the road was so narrow that it was impossible for two vehicles to pass, thus all the ambulances and ammunition and supply wagons had to go in together and all come out together. The mountain road ran parallel with a ridge on which the enemy had his trenches, the distance between the two, across the gully, being only two hundred yards; thus the road was under rifle and machine gun fire, and on several occasions wounded men were wounded a second time while lying on their stretchers. Even the striking of a match, under such conditions, might have had fatal consequences. On many of the higher mountains vehicular traffic is impossible. Ammunition and sup-

plies have to be taken to the men in the trenches by means of pack mules, and men wounded in these positions have to be brought to the divisional dressing station on mules. In certain cases aerial trolleys have been erected from one peak to another, or from some mountain to a place in the valley, and use is made of these to get wounded removed from the front.

No Uniform System

Probably enough has been said to show that there can be no uniform system in the removal of men from the front dressing stations to the divisional field hospitals. A system which might be very satisfactory in one district would be altogether useless in the next, but the point on which it is desired to insist is that the motor car ambulance figures on every one of the stages and has no rival. From this it must not be inferred that horses are not used. They are to be found practically in the trenches, and they work so far to the rear that even the echo of the guns does not reach them. Their presence can best be explained by the fact that they existed before the war and nobody in authority has thought it necessary to abolish them. Yet there are some infantry divisions on the front without a single horse for their medical service. Others have both horses and motor cars, nine-tenths of the work being done by mechanical and the remaining tenth by animal traction.

It is one of the fundamental principles of army ambulance service that wounded men must be removed as far from the front as possible, and quickly. A man shot

down on the field is not taken to the nearest hospital and allowed to remain there until convalescent. To obtain an insight into what really happens, we might return, in imagination, to the courtyard of that one-time seminary, where four American-built ambulances were loading under the crossed fires of friend and foe. The majority of men have been brought or have walked in from the trenches, where their wounds have been summarily bandaged—just enough, in fact, to stay the flow of blood. Some, indeed, have had no dressing at all.

It is very comforting for the stay-at-home to imagine a perfected system whereby, on a man being wounded, somebody presses a button and a motor ambulance springs up. For several miles behind the actual trenches troops and supply columns come under the fire of the enemy's guns, and these men do not have a motor ambulance attached to them, nor are they supplied with stretchers or stretcher bearers. If an empty ambulance happens to be passing, it is hailed and pressed into service; but the wounded man may make his entry into the dressing station in a decrepit perambulator, in a broken wheelbarrow, in a child's go-cart, or laid on a broken shutter, or carried in the arms of some sturdy companion. The motor ambulance has many rivals—perhaps it would be better to say auxiliaries—in the zone where men fight and die.

The divisional dressing station is capable of carrying out simple operations. And by a simple operation, in military parlance, is

meant the removal of a leg or an arm, or perhaps both legs, or both arms, or one of each. If the case presents any complexity, as for instance a serious stomach or head wound, the patient is removed as quickly as possible to a motor car field dressing station maintained just beyond the range of the enemy's field artillery.

Unless they had one of these complicated cases aboard, the drivers of the ambulances would receive instructions to proceed to a "smistemento," or clearing station. This meant a run of about a mile to the river, the crossing of the stream by a pontoon bridge nearly always under direct fire, then a run of about 7 miles over a mountainous road, which but a few months before was the scene of a violent battle, and is in consequence still rough and difficult to negotiate. For the first 3 of these 7 miles the road was shelled with more or less regularity.

Means of Communication

The officer in charge of the smistemento, or clearing station, maintained a list of all the hospitals within a radius of probably 15 miles. He was in telephonic communication with these hospitals and kept informed daily of the number of patients and the number of beds available. As each car came in the distributing officer decided to which hospital the men should be sent. The choice was not made haphazard. Some hospitals specialized in sick men; others were well equipped for dealing with surgical cases; some preferred frozen feet; some dealt in eye wounds only; some cared for nothing but dysentery. In addition to medical skill, some experience was necessary in forwarding, so that in the first place different kinds of wounds should not be mixed, entailing long journeys and several calls for the cars. If it happened that all the hospitals in his zone were filled, the clearing officer would send the load to the clearing officer at the head of zone No. 2. There they would all be unloaded and distributed to the various permanent hospitals in that zone by cars kept specially for that work. The drivers working from the divisional dressing station got rid of their patients at the hospi-

tals in zone No. 1, or at the clearing station at the head of zone No. 2. Motor car services were maintained specially for removing men from the hospitals to other hospitals in zone No. 2, or from this latter zone to the railroad.

The nature of the Italian front makes it necessary for wounded men to be carried greater distances by motor car than on any other point of the western European battle-line. Even in peace times there were few railroads, and most of those in existence were single track lines. Further, the greatest activity is in the enemy's country just beyond the Isonzo river. The Austrian artillery sees to it that no railroad line is established over the river, and indeed in many cases it is not even possible to approach the river by rail. Yet such is the mobility of motor traffic that thousands of ambulances, cars, and trucks cross the river day and night.

There appears to be an impression that horse ambulances will operate nearer the front than motor cars. This is not the case. A successful offensive presents the most strenuous conditions for any ambulance service, for then roads have practically ceased to exist and to move any kind of vehicle entails herculean efforts. When the Italian troops captured the city of Gorizia, in August of last year, the first troops to move ahead were cavalry who swam the Isonzo. There was one bridge which had not been completely destroyed, but it was in such a poor condition that mules, carts and men frequently dropped through the holes into the stream below. Notwithstanding these difficulties, the first ambulances to cross the river and get into the city were Ford and Buick motor ambulances of the British Red Cross.

Some time ago the mysterious power which controls this huge fighting machinery decided that gasoline must be economized. In consequence orders were passed down stage by stage, from the supreme command to the humble ambulance driver that the motor cars should remain idle and that all wounded, with the exception of serious stretcher cases, should be carried by horse ambulances.

One of the divisions most affected by this new order had been using about eight of its own Fiat ambulances and a daily average of four British cars, the horse ambulances being kept mostly as a standby for times of great activity. From this divisional dressing station the wounded had to be carried a distance of about 10 miles to the clearing hospital. For more than half this distance the roads were constantly under fire; further, the surface was very poor, with gradients varying from 8 to 14 per cent. With motor ambulances loads of ten sitters or four stretchers were carried to the clearing hospital and forward from there to the permanent hospitals in zone No. 1, a distance of 40 to 50 miles for the round trip, in 3 to 5 hrs. With 4-horse teams, and a load of only six wounded, the journey from divisional dressing station to clearing hospital—20 miles for the round trip—occupied from 6 to 8 hrs., and at several points the wounded men were obliged to walk and even help push the empty ambulance. At the end of a week the horses were in such a condition that the officer in charge formally reported that he was unable to continue the work. Everybody was dissatisfied, and the impossibility of carrying on this work by means of horses



The old school-horse ambulance working between front line and divisional dressing stations



An Italian horse ambulance section uses the back yard of a wrecked Austrian cottage as a stable



Loading wounded into Buick ambulances at a front line dressing station at the Italian front

was so evident that orders were given for the motor ambulances to resume service. This incident occurred at a time of very slight military activity, when the number of wounded was at its minimum.

It is particularly important that wounded men should be moved from the zone of operations as quickly as possible. A wounded man in the trenches is obviously an incumbrance to everybody. There is more room at the divisional dressing station, but as it is never known when an attack will be made, the rule is to get men away without delay. If a man is kept more than half a dozen hours it is generally an indication that his case is hopeless, and that the doctor considers he might as well die there as on the road. These dressing stations, too, are under fire, and to keep helpless men in them is only to increase their risk. One instance may be given when the Austrians shelled a dressing station and killed about a dozen slightly wounded men who were waiting to be moved to the rear. But for the motor ambulance service, which had removed 150 of these men, in heavy rain and complete darkness, almost as soon as they came from the trenches, there would have been terrible massacre at this point.

Dangerous Part of Work

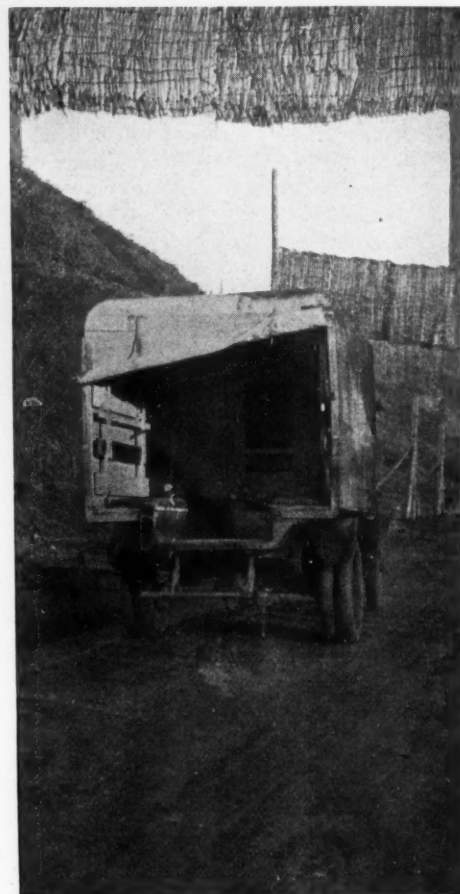
The most exciting ambulance work at the front is that which falls to the drivers attached to the regimental and divisional dressing stations. The element of danger is certainly less than in the trenches, but is higher than for the artillery, engineers and other services, for not only has all the work to be done under shell fire, but the men must of necessity live permanently within range of the enemy's field pieces. In practically the whole of this zone night driving has to be done without lights.

It is no easy matter to devise a motor ambulance system which will work equally well under the monotony of stationary trench warfare and during the excitement

and nervous tension of a big battle. During the periods of local skirmishing and slight artillery activity, there are several systems which give perfect satisfaction. Cars run up to the front line dressing stations—or as near to them as the nature of roads will permit—at stated hours and bring back those sick and wounded who are unable to walk. Sick men make their way to the rear afoot and report at the divisional dressing station. Each man's wounds can be carefully attended to, all particulars concerning him are entered in a book, and twice a day, usually morning and evening, the motor ambulances are loaded up and sent to No. 1 clearing house for distribution among the hospitals in zone No. 1. Each driver carries a list of his men, and brings back a receipt from the hospital at which he has discharged his sick and wounded. The same routine goes on in zone No. 2, the only difference being that the men are cleaner and less blood-stained, the road conditions better and

entirely free from shells. If at any time a request came in for information regarding any soldier, in a few minutes' time all particulars could be furnished regarding him.

But if the enemy launches an unexpected attack, or the home troops are given the



Buick ambulance running toward the trenches over a screened road

order to take some position, conditions change completely and the probabilities are that the attempts to keep track of each individual wounded soldier will break down or be abandoned altogether. Then



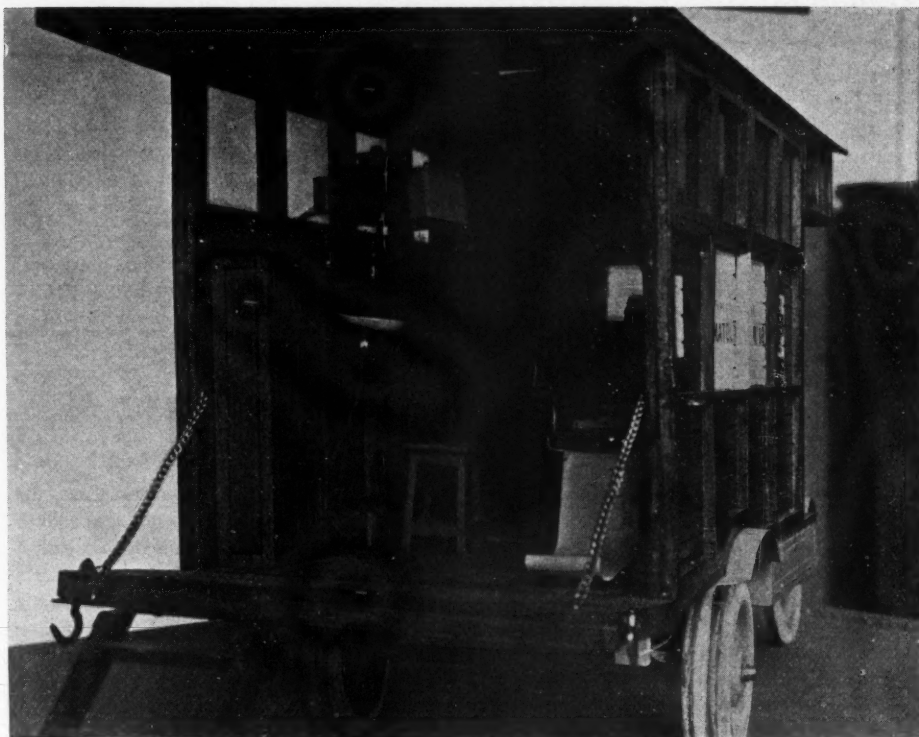
Loading ambulances at a divisional dressing station. Shells were bursting within 50 yards while this photograph was being taken

the ambulances serving the front line dressing stations are running up and down the road all day and all night long. They drop their loads at the divisional dressing stations and run back for more. The surgeons, in their small operating room, dress and probe wounds silently and dexterously. As each case is finished the surgeon swings on his heels and finds another in front of him; when that one is finished he swings round again and finds another awaiting him. The men responsible for dispatching the wounded fill up the car sheets if they have time. But if the wounded man cannot speak and his identification disk is not immediately to hand, he goes away unrecorded. Life-saving is more important than bookkeeping.

Task for Nerveless Men

The ambulance drivers running from the divisional dressing stations to the first permanent hospitals are only concerned in unloading and returning as quickly as possible. Frequently the cars run faster than the telephone, and on reaching the hospital, the driver is told there is no room. If he is a tender novice the driver will go away and look for another hospital—and probably not find it for hours. If he is a hardened veteran, he will unload his dirty and blood-stained cargo, despite protests, and get away without a receipt, knowing that the hospital staff will have to find or make room.

The flexibility of the motor ambulance service is a wonderful factor in the saving of life under such circumstances. Running day and night without a stop, except to dump gasoline into the tank and to pour oil into the base chamber, the regular ambulance drivers find themselves unable to get ahead of the stream of wounded pouring into the dressing station. They eat while driving and they try to ignore the law of sleep; they rush on whether the



Dental car on service at the front. It is towed behind an army truck

road is clear or whether shells are dropping on it; they unload their own cars and curse hospital attendants who utter the full-house cry, but still they cannot get the dressing station clear. At such times valuable help can be given by ordinary army trucks. Many of the men are only slightly wounded—an arm, a leg, a shoulder, a finger, a toe—enough to put them out of the firing line and yet not enough to call for the immediate attention of the trained nurse. Such men are loaded into trucks hastily fitted up with plain deal seats, and in loads of twenty-five to thirty are cleared out of the dressing station. It is not a

joy ride; perhaps some of the men suffer from the jolting in such tightly packed quarters, but they are cleared away to the rear where there is more room, leaving the properly-equipped ambulances for the seriously wounded.

It generally happens that when infantry attacks are launched numbers of trucks have nothing or little to do. The engineers, for instance, have lessened duties when the infantry is actively defending an old or trying to capture a new position. Thus the trucks which are normally employed for bringing up all kinds of building material can very advantageously be used for removing slightly wounded cases to the rear. In some armies the value of this temporary aid is so much counted on that the trucks have internal fittings allowing them to receive transverse seats at a moment's notice. There have been cases of big and unexpected gas attacks when, but for the temporary aid of motor trucks, the entire ambulance and hospital service would have been congested to such an extent that it would have collapsed.

Fiats Lead in Number

The huge majority of ambulances employed in the Italian army are Fiats with four-cylinder, block-cast motors of practically 4 by 5.5-in. bore and stroke. The Italian Red Cross Society, all the members of which are militarized, make use of all types of cars, many of them being converted touring cars. Finally, the British Red Cross has various sections on the front and uses Buick C4 truck chassis, the G.M.C., a very small number of Fords, and a variety of converted touring cars of English, French and even German make.

(Concluded next week)



British ambulance section under shelter of trees on the Italian front. This open-air garage is under direct shell fire

Resta Out of the Races?

Speedway Champion Says He May Not Compete This Year

Peugeot Contract Is Reported to Be Unsatisfactory

CHICAGO, March 16—The king of the speedways may not be seen at the wheel of the blue Peugeot this season. After capturing four speedway classics and the Vanderbilt cup road race last year and winning the 1916 A.A.A. championship and all that the term implies, Dario Resta announces that he probably will not drive this year.

Two reasons are advanced for Resta's retirement. It is said that he is not satisfied with his contract with Alphonse Kaufman, owner of the Peugeot in which Dario scored his American triumphs, and also that his wife, a sister of the late Spencer Wishart, fears that he will meet the same fate as her brother, who was killed at Elgin in 1915.

Although Resta has been offered a position on the Hudson and the Mercer teams, he probably will not accept either. He is said to be seeking a position as a consulting engineer or an opportunity to invest \$40,000, his share of the purses he has won in this country, in a business less hazardous than driving racing cars.

The prize money that Resta has won in this country in two years totals \$100,000. Of this sum, \$53,000 was contributed by the management of the Chicago speedway, where he proved to be invincible and took six races out of as many starts.

CHICAGO PLANS SELLING RACE

Chicago, March 17—An innovation of a speed contest is planned for the curtain-raiser of the Auto Derby at the Chicago speedway June 9. This will be a 100-mile contest for pleasure cars, not special racing machines, in which each car is to have a fixed price at which it will be offered for sale when the event is over. A silver cup and medal will be the prizes. The speedway association asserts that among those in prospect are Mercer, Cadillac, Haynes, Hudson, Marmon, Packard and National entries.

Strictly professional drivers are barred from competition, but motor car dealers who are not classed as amateurs by the American Automobile Association, as well as private owners, will be eligible. No prize money will be given, a silver cup being awarded the winner and medals to the drivers finishing second and third.

In fact, the proposed race is a combination of the amateur and dealer's events that were held on Chicago speedway last year with the car-selling feature added. With motor car distributors along motor

row and individual owners in their clubs championing the speed and stamina of the cars that they represent or drive, the Chicago speedway officials believe that such a race will be a success, for the rivalry and enthusiasm already exists and all that seems to be needed is a field of battle and a definite date for the settlement of the spirited dispute.

The selling race will be held in the morning, the cars being sent away at 10 o'clock so that the event will be over by noon and the course clear for the professionals who will start their chase of prize money in the Auto Derby at 2.30 p. m.

DE PALMA GETS READY

Chicago, March 16—Dario Resta may be determined to withdraw from the racing arena, but not so his famous rival, Ralph de Palma, for the latter is more ambitious than ever and promises to appear in every important race staged in the United States this summer. He was the first entrant for the Indianapolis Decoration Day races, nominating two cars, the familiar cream-colored Mercedes and the other a Peugeot.

A remedy for the skittishness displayed by the Mercedes on several occasions last year has been attempted by rebuilding the machine and installing a new engine. There is little left of the original Mercedes except the name, inasmuch as virtually every part of the present car is a product of de Palma's own shop.

The Peugeot will be reconstructed in the Allison shops at Indianapolis, and it is expected that the pilot for this car will be the racer's brother, John de Palma.

DEMONSTRATING DRIVEAWAYS

Chicago, March 16—Driveaways as a means of combatting the freight car shortage, has not been confined to the factories, for the dealers and branches are making use of them, and new phases of the value of this means of transportation are asserting themselves daily. Driveaways from the Chicago distributors of the Chalmers Motor Corp. were featured this week. To get the benefit of the \$1,090 price which was raised to \$1,250 recently, scores of Chalmers' dealers, unable to obtain cars in time via rail, made the trip to Chicago and drove their cars home overland.

Ford is also distributing cars by like means, and the assembly plant at Chicago is the scene of almost daily driveaways, dealers within a radius of 300 miles of the plant resorting to this way of getting their cars.

The driveaway system has demonstrated its advertising value in more ways than one. At first the uniqueness of the idea attracted, but now that this has become quite commonplace, attention is called to the fact that the manner in which the machine stands up after these long drives is a strong argument for the sale of that particular car.

34,000 Tractors in Use

Government Census Shows Illinois Operates More Than Any Other

Nine States Have More Than 1500 Each

WASHINGTON, D. C., March 19—More than 34,000 farm tractors will be used during the coming season, according to the United States Department of Agriculture, which has obtained its data through letters sent to 32,000 selected correspondents. The estimate includes only those gasoline and kerosene tractors which are to be used in farm operations this season. Steam-driven tractors, tractors purchased but not delivered and tractors employed for road or other than farm work were excluded.

Illinois, it is estimated, will use more farm tractors than any other state, or 3202. Kansas will use 2287; Texas, 2235; Iowa, 2223; North Dakota, 2137, while California, Indiana, Minnesota, Nebraska and South Dakota will use more than 1500 each, it is estimated.

The figures for the Eastern states agree closely with those of the West. Some of the Western states, however, are not as well represented in the table of estimates as they might be, owing, it is explained, in part to the abandoning of tractors too old for work and to the less intimate knowledge of tractors the reporters in some districts would have than would those in the more thickly populated and smaller counties of the East.

CINCINNATI SPEEDWAY PREPARES

Cincinnati, O., March 16—In anticipation of the coming racing season, the Cincinnati course is assuming the aspect of a spring training camp, many of the drivers and star pilots being already on that boardway trying out their cars. This city enjoys the advantage of having the most southern race course in the United States, besides one of the fastest, and therefore attracts all drivers. June 23 will open the season for Cincinnati, following the events at Indianapolis and Chicago.

S.A.E. TO ASSIST

Atlantic City, March 14—The Society of Automobile Engineers to-day appointed what is known as a steering committee, whose duty it is to discover all the ways it is possible for the society membership to co-operate with the government in military matters. The committee of three consists of: Geo. W. Dunham, president; W. H. Vandervoort, past-president, and Jesse G. Vincent, member of the S.A.E. Council. This committee expects to make thorough investigations at Washington and to report

to the society at the next meeting of the council.

With the object of increasing the finances of the Society of Automobile Engineers the Council has practically approved of a submitted plan by which it is hoped to raise upward of \$500,000 by subscriptions as an endowment fund for the society. The revenue for this amount, according to the plan, is to be used for such work as standardization, research, educational and government co-operation. For over a year Christian Girl, president of the Auto Parts Co., Cleveland, Ohio, and also on the finance committee of the society, has been working on a plan for this endowment. The plan embraces subscriptions from a wide range of manufacturers and others connected with the motor car and accessory industries.

The disposition of the endowment will rest with the committee of five made up of three past presidents of the society and one member each from the motor car industry and the accessory industry.

So successful has the two-day session of the Council held in this city yesterday and to-day proved that it was voted to hold the April meeting of the Council in French Lick, Ind., April 16 and 17.

The S. A. E. Council completed to-day broad plans for the big membership campaign for the month of April. The plan is to add 1000 new members so that the society will have a bigger representation for co-operation with the Government in any and all matters. The plan is to have each existing member secure one new one. The seven sections of the society have been asked to appoint special committees and make a broad canvass of all factories in their localities. From these factories the names of eligibles will be compiled, and beginning April 1 an aggressive campaign of each section instituted. In forty or fifty cities where there are not sections special committees are being appointed for membership work. These committees are compiling names in the same way as the sections.

To assist the standing membership committee of the society in its work, the Council voted to engage a special clerical force for the exclusive use of the membership committee during April. R. O. Gill, chairman of the Membership Committee, Saxon Motor Car Co., Detroit, will have complete charge of the work. This committee will hold luncheon meetings every day during April.

DETROIT SECTION MEMBERSHIP

Detroit, Mich., March 16—At the meeting of the Detroit section held at the Pontchartrain last night the membership reached 916. This is a gain of 128 in the last week. The objective point is 1000 by April 1, and at the rate at which applications are coming in this will be attained. During the last month the gain in membership was 300.

Born of Necessity

Ideas Evolved to Combat Effect of Possible Strike Show Forethought

Plans Made Considerable in Advance to Meet the Situation

CHICAGO, March 20—With the possibility of a railroad strike being called, motor car and accessory dealers looked ahead and attempted to formulate plans for continuing their business as long as possible. A canvass of the situation in Detroit showed that the factories are not well supplied with all necessary parts and materials, but have a supply to last only a few days or a week. A strike of one week's duration would have put practically the whole industry in Detroit out of the running. The supplies of tires as far as can be learned is in fairly good shape, and dealers in the Central West contemplated bringing stocks overland by truck if necessary.

Congestion and frequent embargoes on freight shipments during the last few months have taught distributors a lesson, and they realize that preparedness is a necessary safeguard to business. During the last winter a dealer in Louisville, Ky., has put an empty barrel in each freight car coming in with motor cars for him and consigned the car back to the factory. It cost \$25, but the factory stood half the expense and he has been able to get his motor cars delivered when others could not.

More Trucks for Transportation

St. Louis truck makers looked forward to a big increase in sales of commercial vehicles if the strike had materialized. They were prepared to furnish trucks for hauling coal from the nearby mines and for other freight service. Some of the cities on the seaboard and on navigable streams did not look forward to a shortage in fuel to any great extent, though tank steamers have not been plying the waters so frequently as they once did. Dealers and garage men laid in a supply of gasoline and in no city did the situation seem to presage a shortage of fuel unless the strike lasted a month. They were prepared for the emergency.

Dealers in the Central West felt that they could cope with the situation by driving cars through as many of them are doing now. In Columbus, Ohio, the Buick dealer has not received a car by rail since December, so with this condition having been met, the only thing to fear was that the factories would be unable to keep producing cars.

Investigation of possibilities of transportation of cars from factories to Chicago and points in that territory brought out

the fact that it would be possible to ship direct by boat from lake points to Chicago, if the cars were knocked down, and that the difference in freight rates between railroad and steamer would pay for the assembling. For Michigan inland factories, freight service on electric roads to lake points could be made to serve.

The territory in the neighborhood of Chicago is particularly fortunate as regards supplies of gasoline, some of the largest refineries and stores of fuel in the world being at Whiting, only 17 miles away. Territory within a radius of 200 miles could be served by truck, as it is done to some extent now.

VANDERVOORT ON COMMISSION

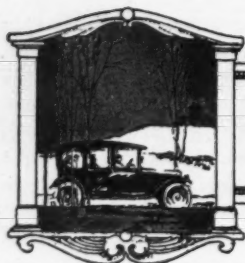
New York, March 19—W. H. Vandervoort, president of the Moline Automobile Co., East Moline, Ill., and past president of the Society of Automobile Engineers, has accepted the appointment on a government commission which will have to do with standardizing ammunition for U. S. A. It is generally known that for the last two years the Moline company has in addition to its motor vehicle business and its gas engine work built large quantities of ammunition for the European belligerents. Mr. Vandervoort should be well qualified for his new position.

CHICAGO GETS TAXI STANDS

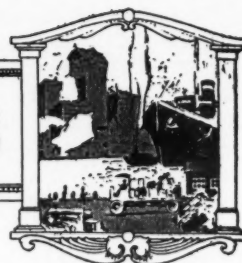
Chicago, March 20—With the passage of the new traffic ordinance barring parking in the loop district after May 1 came a cry from the taxi concerns that unless they were allowed stands in the downtown district they would be unable to maintain their rates, since they would be obliged to garage their cars some distance from the loop and thus could not give as quick service nor operate at so low a cost. This cry has been heard by the city council, and consequently that body has passed an ordinance providing for fifty stands, beginning May 1, thirty-one of these being in the loop and the others in districts close to the downtown district. Stands also will be maintained on the South, West and North sides of the city, which has not been done to any extent heretofore.

NEW AUTO PARTS POLICY

Chicago, March 16—At the annual meeting of stockholders of the Auto Parts Co. held recently an entire new board of directors was elected. With this change, a new policy was adopted, said to be unusual in the accessory field. Heretofore, a considerable portion of the business has been consumers' trade, and as this company has an active mailing list of consumers totaling almost half a million, it is rumored that the change will affect this end of the business. Details of the plan will be announced later. No new capital has been brought into the company, statements to that effect in MOTOR AGE issue of Feb. 1, being incorrect.



EDITORIAL PERSPECTIVES



Where Shall We Park?

ACCORDING to a very accurate census made in the city of Chicago during the summer months of 1916, there was an average of 68,000 vehicles each day entered the $\frac{3}{4}$ of a square mile that comprizes the heart of the business district of the city. Of these a very large percentage represented the cars of business men, who left their cars either in the loop, as this area is known, or parked them in the municipal parking space on its outskirts. Other large cities have similar reports to make, and in all of them there is this same cry of "Where shall we park?"

FORCED by the physical law that two bodies cannot occupy the same space at the same time, municipal authorities have enforced regulations prohibiting parking on congested streets in order to permit pedestrian and vehicle traffic to move with some degree of safety and dispatch. They are succeeding in clearing the streets of stationary vehicles, but they are

robbing the motorist business man of his opportunity of increased efficiency through the use of his car and are forcing him to add his bulk to increase further the overcrowding of the public utilities' transportation service.

It is not the resident motorist alone that suffering from the present lack of accommodations during the business day. The visitors within our gates are like sufferers. We owe something to them. To fail to provide adequate means of parking tourists' cars is as reprehensible as for a host to fail to provide accommodations for his guests. Aside from the standpoint of hospitality, cities whose parking provisions are inadequate lose that commercial advantage gained by out-of-town visitors. As an instance, it need only be cited that there were more than 17,000 tourists who passed through Chicago in motor cars last year. There may not be so many this year, if the difficulty of downtown parking becomes a factor.

The Philanthropic Car Owner

MOTORISTS in the state of Illinois find themselves in the anomalous position of advocating a measure which most of them feel will unjustly add to their license fees. The majority of motorists of the state, if given the opportunity, in all probability will vote to double their license fees to pay for improvements which will benefit directly 89 per cent of the population of the state, whether they be car owners or not.

ILLINOIS, which has enjoyed the doubtful distinction of ranking twenty-third among the states in roads, seems about to realize a good roads system, or rather a 4000-mile unit of a proposed 16,000-mile system. Someone has evolved the idea that motorists get all the good of the roads and therefore they should build them. The burden of building this proposed 4000-mile unit is to be saddled on to some 300,000 car owners for the next twenty-five years, while the remaining five and one-half million or more pay nothing yet get their property values enhanced materially and use the roads for hauling their crops to market, for their children to move back and forth from the home to the school.

THE governor of Illinois emphatically states that he will indorse no movement that is to increase the general taxation. He declares that it cannot be done without bankruptcy.

Think of it! Illinois, the richest agricultural state in the union, with practically all of its acres under cultivation, and these acres bringing from \$150 to \$200 an acre, yet land owners cannot afford to pay an average of 2 $\frac{3}{4}$ cents per acre for the next quarter century to realize enough millions to build a highway system!

INSTEAD of spreading the \$60,000,000 bond issue out over the whole 6,000,000 inhabitants of the state, 300,000, who own motor cars, must stand for an increase of 100 per cent in their license fees to meet the payment of these bonds.

It is not so much the money involved as it is the discrimination against the motorist. True most of the motor organizations have come out for the proposition. It must be admitted that most any motorist will be willing to pay twice his present license fee if he can ride over good hard roads. It will mean more comfort for him, lower maintenance cost on his car and longer life to his car. In spite of this, however, it seems shortsighted policy that places the burden of building a system of highways in Illinois on one-twentieth of the people, when it is conclusively shown that 89 per cent of the people will be directly benefited by the roads when completed.

The Spring Tire Epidemic

THERE is no other time in the year when tires seem to give you more trouble than when you take your car out for the first few times in the spring. On the bright Saturday afternoon and on Sunday you will find the road well lined with cars making changes of tires. It is not all bad spring luck but rather due to a condition that has been in the making for several winter months: A little retrospect will remind you that while you have been driving your car a good deal all winter that you may not have changed a tire since October or perhaps September. It is surprising how long a tire will run in winter without giving trouble. The weather is cool, which helps out very much. But with a hot spring day it is all changed.

It will prove worth while to have all of your tires looked over before you take the car out for your first Saturday afternoon trip. Take every demountable rim off and get the rust removed. Take all casings off and deflate them. Remove the inner tubes. You may have to add some chalk and clean the casings out. This will prove worth while, but it will not eliminate the spring tire epidemic. The epidemic is largely due to your having kept your car relatively idle during the winter months. The car has stood for a week, two weeks or perhaps longer without even moving. This is hard service on tires. When a tire gets such treatment it will surely give you more or less trouble when the spring arrives.

Should Only the Car Owner Pay?

Looks Now as if Illinois Would Have \$60,000,000

Road Bonds Retired by Doubling

License Fees

ACTIVITIES at Springfield, Ill., last week in good roads affairs should provide one-twentieth of the population of Illinois that owns motor cars much to ponder upon. Governor Lowden in his campaign platform came out strongly for a system of permanent roads in Illinois, but little was said at that time as to where the revenue was to come from to build this system of roads. Now it appears that the initial portion of a proposed 16,000-mile system, in other words, 4000 miles, is to cost \$60,000,000, and if bills now before the Legislature pass, the proposition of issuing this \$60,000,000 in road bonds will be put up to the voters of the state at the next general election in 1918. Further, it is proposed that the motorists of the state furnish the funds to retire these bonds plus interest through a 100 per cent increase in license fees, a bill for this purpose now being before the Legislature, in which it is proposed that a 50 per cent increase become effective Jan. 1, 1918, and another 50 per cent Jan. 1, 1920. It seems a paradox that it should be necessary to put the question of issuing this \$60,000,000 bond issue to a vote of all the people when such a limited number of persons, compared with the total population, are to pay the price.

Lowden Against Further Taxation

When the members of the Illinois Highway Improvement Association and other good roads men went into conference last Tuesday, Governor Lowden made it emphatic that he would support no measure involving an increase in general taxation.

"We could not add a single cent to the general taxation of Illinois under the present constitution without going bankrupt," said the governor. "Taxes are as high as the people can bear. If you are right in your calculations, it seems to me your proposed bond issue is a safe, conservative, business enterprise, which ought to have the consideration of the people of the state, but whether or not it is just to impose the cost on the motorist, it is the only way you have a chance of success."

Perhaps the governor is right, but it will take considerable explanation to give a plausible reason why land owners in Illinois—the richest agricultural state in the union—should not be able to bear a portion of the expense of building a road system which, according to figures and maps shown at the Springfield meeting, benefits 89 per cent of the population.

The Illinois Highway Improvement Association went to the expense of compiling figures, which were published and distributed, showing that a 2½-cent tax per

acre on Illinois land over a period of 25 years would produce the same revenue as a proposed 100 per cent increase in motor car license fees will produce in that time. It may be said that almost by the turn of a hand, these carefully thought out plans and figures for taxation to meet the big bond issue, were consigned to the waste basket by the association officials as soon as they surveyed things at the capital.

It may be true that the motorist gets the greatest benefit from good roads but no one can dispute the fact that a good road enhances the value of adjoining property and it was only reasonable that every one benefited by good roads should do their share toward building and maintaining them.

Illinois roads and mud have become synonymous and people from other states who have had occasion to cross Illinois carry with them a very lasting impression of the inadequacy of Illinois roads. There is no question but that the state needs a system of permanent roads but it is questionable whether or not the motorists should be obliged to pay for a system of highways which statisticians plainly show will be available to 89 per cent of the population and connect all towns and cities of 2000 and upwards.

It is estimated by the secretary of state that there will be 300,000, possibly 350,000, cars in Illinois registered this year and figures have been obtained which leads this office to believe that by 1925 this number will have increased to 600,000. Beyond the 600,000 marks, those who compile the figures do not go, seemingly believing that the saturation point for Illinois will have been reached by that time. Figures have been compiled showing that with the proposed 100 per cent increase in license fees, the volume of money obtained from this source each year, graduating upward until 1925 and then remaining stationary until 1945, will produce \$145,000,000. The bond issue, if it passes, will cover a period of six years at \$10,000,000 a year and during the life of these bonds—the last of them to mature in 1945—interest charges will be \$22,000,000. This will leave \$63,000,000 for maintenance purposes and other road building.

Governor Lowden pointed out to the road men that the bond issue must not outlive the improvements they make if they are to be a success; in other words, roads must remain in good condition at least as long as

it takes to retire the bonds that furnished the funds for their building. The road men back of the proposed issue of bonds are reticent with regard to the material of which the proposed roads are to be built. Certainly at \$15,000 a mile, they must have had something in mind other than macadam roads and it is a well-known fact that to build a brick road with a concrete foundation would require more than this amount per mile, so it may be inferred that this road system is to be of concrete, although some concrete roads have cost as much as \$18,000 to \$20,000. If this system of roads is built, it should be constructed in the best possible way regardless of whether it costs \$15,000 or \$20,000 per mile, for the initial one-fourth must be a monument of endurance and utility, if it is hoped ever to complete the remaining three-fourths.

No one disputes the fact that we need paved roads but the question is: Who is to bear the expense? Just now it looks as if 250,000 to 300,000 people out of the state's population of 6,000,000 are to shoulder all the burden. Looking at it from the standpoint of abstract justice, it is a quaint, old-fashioned idea to be smiled over perhaps rather than grimly argued against, but typical nevertheless of the roundabout way of getting at things we so frequently use in the United States.

Motor Car Not a Luxury

The idea still prevails, it would seem, that the motor vehicle is a luxury pure and simple and the owner thereof a droll spendthrift who is a bit different from ordinary people. As a matter of fact the motor car nowadays is well up in the list of prime necessities.

No doubt there will be much argument as to this bond issue and the good roads men, many of whom are not motorists, will want sympathetic listeners when they explain why the man that maintains a horse-driven vehicle in Illinois is asked for no license fee in return for the better highways over which he drives. Necessarily they will talk to the car owners and it seems likely they will be hard pressed for an explanation as to why the keepers of hotels, road houses, small town garages, each one of which finds its property value increased by opening up road travel, should pay no part of the state money that builds the roads.

It is evident to any one who attended the Springfield meeting last week with an unbiased mind that the question to be decided is not whether it is fair to motorists, but whether it is desirable on the whole to ac-

(Continued on page 17)



A corner of the show. At the right is a part of the Stewart-Warner vacuum fuel-feed exhibit. Stewart has installed the display cases of spark plugs, speedometers, pumps, vacuum tanks, etc., which attracted so much attention at the New York and Chicago shows. In the foreground is a part of the Beckley-Ralston exhibit and beyond are the Johnson products

Chicago Department Store Stages Profitable Motor Accessory Show

Opening Day Sets Record for Visitors and for Sales Throughout Establishment—Exhibition Gets Credit

CHICAGO, March 19—Combining department store methods of merchandising with exhibition features similar to those of the national motor car shows can be made a most profitable method of marketing motor car accessories by a general store and at the same time can be utilized in increasing to a large extent sales of other lines of goods handled by that store. This is being demonstrated most forcefully this week in the second annual accessory show which is being staged by Rothschild & Co., one of Chicago's largest department stores.

That motorists are attracted by department store methods of merchandising is proved thoroughly by the results of the first day of the show, which opened last Saturday and closes next Saturday. Rothschild & Co. kept a very accurate check on the number of visitors to the seventh floor of the department store Saturday and at the end of the day had recorded 50,000 visitors. At the end of the day, the sales slips turned in recorded sales of slightly more than \$50,000 in that department. In other words, every visitor

purchased \$1 worth of goods in the motor car accessories on the average that day.

Managers of the store asserted that Saturday was the biggest day the store ever had had in its history, both from the standpoint of visitors and the standpoint of sales—this referring to the store as a whole and not to the motor car accessories section only. Entire credit for this was given to the accessory show.

The show itself occupied nearly one whole floor of the store, covering an area of some 175,000 sq. ft. There were 125 exhibitors of accessories, each in an individual booth specially decorated and each attended by a demonstrator either from the factory or from the local dealer or jobber. This is not a manufacturers' display in the sense that the motor car and accessory shows are. Rothschild & Co. own every item exhibited and sold, and sales were made and orders taken by a Rothschild salesman in each booth, who was in addition to the factory or jobber's demonstrator. Some of these salesmen turned in slips at the end of the day which showed sales in some instances amounting to as

high as \$1,800 for the one day. Inasmuch as the salesmen get 2 per cent of their sales during the show, their interest is assured.

Representation of accessory manufacturers and jobbers is quite complete, and very attractive exhibits are staged. Stewart-Warner has installed the display cases of spark plugs, speedometers, pumps, vacuum tanks, etc., which attracted so much attention at the New York and Chicago shows. There is an exceptionally attractive display of Pyrene outfits in the form of a safety-first booth with a Red Cross nurse in attendance. Fisk tires and Goodyear tires are displayed, Rothschild being a Goodyear service station. Other attractive displays are those of Warner lenses, Johnson's prepared wax and cleaners, Johnson shock absorbers, Dann insert, Mileometer, Peter Van Schaack & Sons chamois and sponges, Wilmo manifold, Webb Jay vacuum gages and 120 others.

Practically every accessory susceptible of special demonstration features has some sort of a working exhibit to attract attention. A Ford engine in operation shows the circulation in use of Havoline oil, and a special transmission case demonstrated Havoline greases. This display was one of the many successful ones, as it disposed of from 2500 to 3000 cans of oils and greases the opening day.

The feature of the show from a demonstration standpoint is the display of the Elman Tire & Rubber Co., in which tires

are built complete with the exception of the vulcanizing. So attractive is this exhibit, and incidentally the special prices placed on the tires for the show, that more than 2800 of these tires were sold Saturday. This required the services of twenty-five salesmen, the best of whom turned in sales slips totalling more than \$1,800—the poorest of whom registered something under \$700.

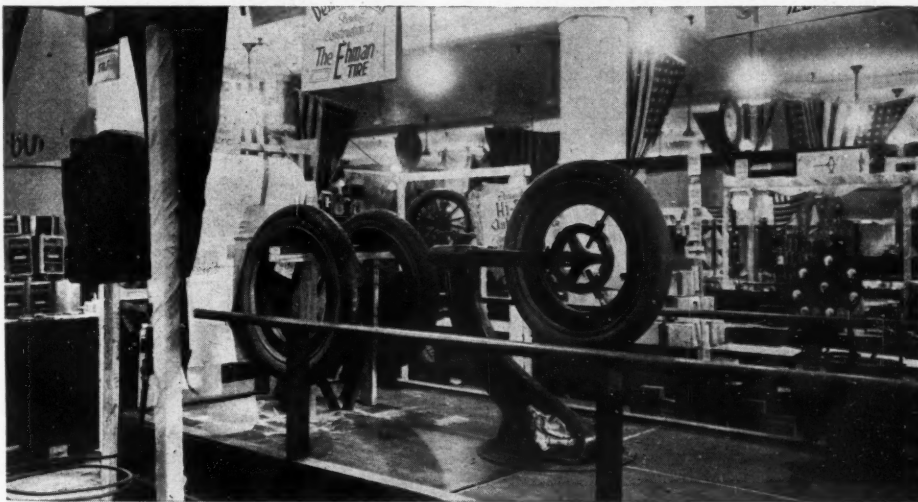
Although this is a show devoted to accessories presumably, there is one complete car exhibit—that of the North Side Buick Co., which had a Buick on display. There are two other complete cars on the floor. One is a Ford used to give a practical demonstration of Mat's body polishes, and so successful is the demonstration that it kept six salesmen busy at three counters, Saturday, and more than 1700 cans of body polish were sold. The other complete car exhibit was in the demonstration of a Camelford truck adapter used in the transformation of a Ford into a commercial vehicle. Such a proposition as this is not susceptible of a great amount of direct business at a show of this sort, but attendants report a large number of likely leads from dealers as well as consumers.

With the idea in mind that the motorist is a very likely prospect for a camera, Burton James company, manufacturer of Rexo cameras, installed a booth and actually assembled the cameras as a part of the exhibition. They proved their point Saturday when sales slips were turned in, as one girl at the camera counter took in \$2,500 in camera sales to motorists that one day. There were a number of specialties for Fords, several Ford starters, including the Genolite and the Heinze, which was exhibited by Arthur Jones Electric Co.

To stage a show of this sort so successfully has required a great deal of work and planning, and also experience not only in selling goods of this nature but also in managing motor car displays. The accessory show is the idea of George H. Israel, the manager of the department. He conceived the idea a year ago and at that time put on a special motor car accessory exhibit on what then was quite an elaborate scale. It had twenty-five exhibitors; this year there were five times that many. It had 20,000 visitors during the first day; this year there were 50,000.

Based on the experience of last year, preparations for the present show were begun five months ago, and a sum of \$2,000 spent for decorating and carpentry work.

A much larger sum was set aside for advertising, and elaborate and extensive advertisements are carried in all of the local papers. Department store methods of cut prices on special lines are carried out but only on such lines as the manufacturers and jobbers consent to have prices cut. The idea of specially attractive prices has been most successful, entire lines of some accessories on which particularly low prices were placed having been almost completely cleaned out the first day. For instance, sets of seat covers with top boot, kick pad and so on, ordinarily selling at \$15, specially priced for this one day at \$5.95, were almost completely wiped out. Tire covers selling Saturday at a figure less than half the regular price were reduced from a



The most elaborate of the demonstrations was the actual manufacture of casings, showing every operation except vulcanizing. Twenty-eight hundred casings of this make were sold the opening day. Rothschild maintains a Goodyear service station, and there were elaborate displays of both Goodyear and Fisk tires



Some of the displays that attracted 50,000 people to one floor of a department store in a single day and took from their pockets \$50,000. At left, Ever Ready; center, MOTOR AGE, The Automobile and Motor World; at right, Pyrene; a very attractive display in the form of a safety first booth with a Red Cross nurse in attendance

stock of 10,000 to a barrelful of miscellaneous remnants. Each day some particular lines have been specially reduced. To-day is Ford Day, and special prices will be limited to Ford accessories. For instance, spotlights specially adapted for Fords may be had for \$1.39 or some similar ridiculously low figure.

In addition there are special features in the way of exhibitors' souvenirs, prizes, etc., offered each day. Saturday the Dann Insert booth gave tags to every inquirer at the booth, these tags bearing numbers, some one of which would draw a prize of a set of Dann inserts at the end of the show. This scheme is the same as was operated in the Dann Insert exhibits at the national shows.

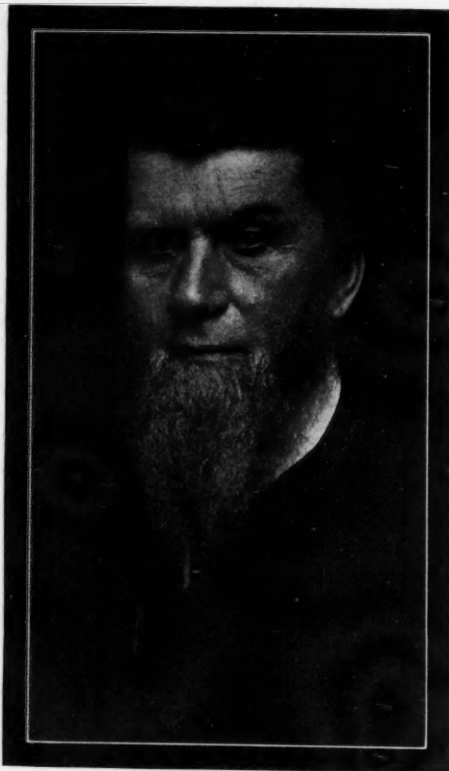
Special arrangements for handling the crowds were made on the opening day in addition to the 350 special salesmen in the exhibits. The Rothschild company had advertised for a week previously special advantages to early buyers, and at 8:30 Saturday morning, when the store opened, every elevator in the building was run express to the seventh floor for the "lucky early buyers" as advertised. Special express service to that floor was run throughout the day.

That the Rothschild accessory show will become a fixture as an annual affair is assured. An attendance of 150,000 is expected before the show closes next Saturday night. The manufacturers and jobbers have recognized its value, as Mr. Israel reports that on account of lack of space it was necessary to turn down fifty late would-be exhibitors.

While the business done both in the accessory department and in the store as a whole during the week is expected to be exceptionally profitable, it is not this alone that makes it worth while. Last year after the very much smaller exhibit, direct sales could be traced to the goods demonstrated at the show for four months after it closed. There is a fair percentage of business occasioned by the show which does not come direct from show visitors but through the incidental advertising. Special arrangements have been made to handle telephone orders from customers who were attracted by the advertising on special lines but who did not visit the store. A special counter with ten clerks is necessary for show visitors who placed orders on goods examined in the different booths but who could not be waited on at these booths.

POTATOES VERSUS CARS

Milwaukee, Wis., March 17—With potatoes commanding jewelry store prices, motor car dealers in Wisconsin and upper Michigan potato-growing districts have been doing a landoffice business during the last few weeks. At the show in Wausau, Wis., a farmer brought in a load of "spuds" and received enough money to go over to the show and lay down the cash for a five-passenger touring car. A similar



J. M. Studebaker, Sr.

South Bend, Ind., March 17.—John Mohler Studebaker, Sr., died today. Mr. Studebaker was the founder and almost to his death was the guiding spirit of the vehicle and motor car company that bears his name.

Born near Gettysburg, Pa., Oct. 10, 1833, Mr. Studebaker, as the son of a blacksmith, learned that trade. In the early days of California pioneering he manufactured wheelbarrows for miners, and by this means accumulated \$3,000 with which he returned from the West to South Bend. Here he purchased an interest in a wagon firm started by his brothers and known as C. & J. M. Studebaker. As years passed he foresaw the future of the motor car and extended the business. The possibilities of the new field inspired him, and though beyond the years when men usually seek retirement he arose to the demands of the motor car industry with renewed energy.

Mr. Studebaker was connected with the Studebaker Corp. of America as chairman of its board of directors until his eighty-second year.

occurrence was reported at the Green Bay show a week afterward. From Escanaba, Mich., comes the story that John Johnson of Danforth, Mich., brought 600 bu. of potatoes to town and traded them in for a new Hupmobile at full list price, plus freight. The A. & J. DeGrand Co., Escanaba, was the purchaser of the potatoes and the seller of the car. The price of the "spuds" was slightly less than \$2 a bushel. Some have sold as high as \$2.50 a bushel in this vicinity.

UNIVERSITY SCHOOL HOLDS SHOW

Columbia, Mo., March 17—Tonight saw the motor car at a new kind of show. Every year the students in the School of Engineering of the University of Missouri have a St. Patrick celebration, at which

the degrees of Knights of St. Patrick are conferred on the senior engineers and entertainments are prepared.

This year a motor show was held in connection with the St. Patrick celebration for the first time. It was given at night on the University campus, where at the end of a class parade the knighting, and the kissing of the blarney stone, took place beneath a model of the 100-ft. Eiffel Tower constructed on the exact scale by engineering students. Out in the open, in a canvas inclosure, reigned the cars, together with a few tractors, motorcycles and accessories. Twenty cars from the Cadillac, Dodge, Chevrolet, Reo, Hudson, Overland, Chalmers and Oakland local agencies were exhibited. Within the engineering buildings the mechanical department had all its offerings in motion, showing the workings under the hood of the motor car, what a horsepower is and a Shamrock machine, while the chemical department made rubies, gave hints on cooking, demonstrated how the co-eds might dye their hair and showed how silver-plating was done. Here, too, St. Patrick's wine was made.

Many manufacturing concerns have sent exhibits for display tonight. Among them are the Westinghouse and the General Electric companies and the National Hydraulic Co. Each department has its own exhibits and stunts, for which advisors and foremen have been working in preparation for the celebration.

That the local dealers made no mistake in thus taking part in an exhibition given by a school wherein future motor car engineers are produced is evident in the attention attracted and the interest shown. Thousands attend these St. Patrick celebrations here. Fifteen years ago an engineering student in the University first discovered that St. Patrick was an engineer, and the discovery has been emphasized in this way each year. The discoverer, by the way, Leo Brandenburger of Salt Lake City, was one of the chosen thirty-nine followers selected as successful knight candidates at this the first St. Patrick celebration to include an exhibition of one of his most valuable constituents, the motor car.

BUICK OPERATING AT CAPACITY

Flint, Mich., March 16—The Buick motor car division of the General Motors Co. is now manufacturing 550 cars a day, which is the full production capacity. The division will continue to operate at this capacity for several months to fill orders.

MAY TEST MASS. OPERATORS

Boston, Mass., March 17—Motorists in Massachusetts are somewhat wrought up at the action of the legislative committee on roads and bridges, who reported to the legislature a bill that would compel every person operating a motor car or motorcycle in Massachusetts to pass a road test.

The original bill called for an examination of those applying for licenses, but the committee inserted a clause making it retroactive for everyone and effective July 1. As a result the highway commission would have to examine such men as Charles J. Glidden, the world famous tourist; Bill Hilliard, who holds the record for climbing Mount Washington; Louis Ross, who won a lot of races at Florida years ago; Fred Tudor, who has held registration license No. 1 since the first cars were registered fifteen years ago; George Morrill, who drove one of the first cars ever operated in Massachusetts; all the old pioneer dealers; and even Colonel Sohler, chairman of the highway commission, a veteran, would have to submit to an examination.

When the bill went to the house for action it was sent to the ways and means committee on a point of order, as it means the expenditure of money. There it will have to be given another hearing. If the bill passed and went into effect July 1, as there is no provision to allow any one time on the test it would mean either a storming of the offices of the highway commission or the holding up of motorists until they were tested. Some might have to wait all summer and not be able to use their cars.

Paying for Roads

(Continued from page 13)

cept the one feasible method offered for the improvement of state roads. If this is made clear at the start, it should go a long way toward clarifying the motor car owners' attempt toward the enterprise.

Viewing the situation from the motorists' standpoint, the increase in fees is an amount not worth quibbling over so far as the money is concerned, especially when consideration is taken of the fact that paved roads mean lower maintenance cost of the car, greater fuel economy and more pleasure in driving. It seems probable that the amount saved from maintenance will be many times over the added cost of licenses.

In Illinois the fees paid in 1916 averaged \$4.94. Assuming that the most popular cars will continue to have the same horsepower on which license fees are based, the average in 1920 under the proposed plan will be around \$10. Arkansas and West Virginia now specify \$10 as a flat rate. The suggestion was made at the Springfield meeting that a \$5 flat rate be charged against cars under 25 hp. and a greatly increased rate be assessed against cars over that horsepower. Secretary of State Emerson showed that this would decrease rather than increase the revenue and drew his conclusions from an average day in his office when licenses were issued to the amount of \$12,000, while \$11,000 of this amount was made up from fees assessed on cars not in excess of \$6.

Army Trucks Reviewed

Government Used First in 1907;
Now Has Twelve Companies of Them

Cost of Operation Per Ton-Mile Is
70 Cents

WASHINGTON, D. C., March 15—In view of the splendid performance of motor trucks on the border during the last few months the annual report of Gen. Henry G. Sharpe, quartermaster general of the army, in which he reviews the activities of the department in motor transportation, is of more than passing interest. General Sharpe says the first motor truck for carrying supplies was procured by the quartermaster's department in June, 1907, since which time the department has made constant progress in developing the motor truck as a means of transportation. Appropriations for this purpose, until recently, have been very limited. The progress of development, however, considering these circumstances, has been very satisfactory.

The quartermaster's department first took up the matter of operating trucks seriously in 1911, and extensive experiments and observations have been made annually since that time. Near the close of the fiscal year of 1916, however, extensive opportunities were afforded for determining the value of motor transportation under severe conditions in Mexico and along the border.

First Specifications Revised

The first specifications of the quartermaster's corps were written in 1913 after extensive correspondence with manufacturers and the Society of Automobile Engineers. These specifications have been revised and brought up to date annually.

During the early part of the fiscal year of 1916 motor transportation was confined to operation of motor trucks in the transportation of supplies between base depots and outlying camps on the Mexican border, in the operation of quartermaster corps depots and at a few posts in the United States and over-sea possessions, where motor transportation could be installed at a saving over animal-drawn transportation.

When instructions were given for the organization of an adequate force of troops to cross the Mexican border, the quartermaster's department was in position to take immediate steps to obtain necessary motor transportation. March 11, 1916, the first call was received from the southern department for two motor truck companies, each consisting of twenty-seven motor trucks of 1½ tons capacity, equipped with necessary personnel for their operation. As soon as the approval of the Secretary of War was received these trucks were purchased and the drivers were hired

at the factories at which the trucks were manufactured.

The department says it has been greatly assisted by representatives of various truck manufacturers in the study of defects and recommendations for improvement in the motor transportation now in operation. By the end of the fiscal year ten motor truck companies, each consisting of twenty-seven motor trucks of 1½-ton capacity, six motor truck companies, each consisting of twenty-eight trucks of 3-ton capacity, and two motor truck companies, each consisting of thirty-three trucks of 3-ton capacity, had been purchased and were in operation along the Mexican border.

At the time the report was written about \$2,175,670 had been expended in motor trucks, equipment and repairs, since which time the amount for motor truck transportation has increased considerably.

The commanding general, southern department, reports that the approximate cost of operation of trucks per ton-mile is 70 cents, which includes all incidentals, such as upkeep of repair shops, etc.

TIPPER JOINS THE AUTOMOBILE

New York, March 16—Harry Tipper, who for nine years has been advertising manager of the Texas Co., has resigned to become manager of *The Automobile* published by the Class Journal Co., in this city. Mr. Tipper is a past president of the Association of National Advertisers, and is now president of the Advertising Club of New York.

COMMERCE INCREASES PRICES

Detroit, March 16—The Commerce Motor Car Co. has increased the prices of its product. The ¾-ton truck is now \$975 for the chassis and \$1,075 for the chassis with any one of the various bodies the company provides. The 1-ton chassis is \$1,240 alone; \$1,275 with an open express body; \$1,350 with an express canopy body; \$1,390 with a stake body.

FLANGED WHEELED DRIVEWAYS

Chicago, March 19—Freight trains composed of motor cars equipped with flanged wheels is the hint which comes from the Cadillac Automobile Co. of Illinois in case of a complete embargo on motor car shipments from Detroit factories.

It is suggested that trains of say six or eight cars could be hitched together and hauled by a "locomotive" car in front. To comply with federal laws, a conductor and brakeman could be carried, the last car serving as a caboose and carrying the prescribed lights and flags.

There is little doubt but what such a train could make enough speed so as to be dispatched easily and not interfere with regular schedules. It is a question what the attitude of the railroads and the Interstate Commerce Commission would be toward such a fantastical step in relieving shipping congestion.

Glare Elimination from Two Viewpoints

Factors Which Produce Dazzling Effect and Means of Preventing It—Need of Standard Regulations Is Emphasized in Two Talks and Some Simple Expedients Are Outlined

E L I M I N A T I O N of headlight glare is such a complex problem that exact information on what constitutes glare and how it can be done away with without seriously reducing the illumination of the road by no means is easy to obtain. Probably this is the reason for the existence of so many so-called solutions of the problem, whose very multiplicity makes harder the lot of the motorist who attempts to learn for himself what he should do about his own headlights. Luckily the past week has

been featured by the presentation of the problem at length in two different ways, and solutions suggested from two different sources. One of these is in a paper presented to the Metropolitan Section of the Society of Automotive Engineers at New York by Alden L. McMurtry, consulting engineer, and the other is a paper which was presented to the Chicago section of the Society of Illuminating Engineers by J. R. Cravath, inventor of the Cravath lens.

N E W Y O R K, March 17—"If the average driver would have his car driven toward him so he could see the effect of his own lamps, there would be less blame placed upon the other fellow and a more concentrated effort on the part of both to lessen the effect of glare," said Alden L. McMurtry in his paper. He followed this by an outline of the factors which affect the production of glaring headlamps and suggested ways in which this glare might be eliminated. He made a strong plea for better standards in determining glare. His paper follows:

T H E essential units of a headlamp from the lighting point of view are the reflector, bulb and socket. The three are of equal importance in the design of a headlamp.

The reflector is a paraboloidal mirror or reflecting paraboloid usually made of metal, the reflecting surface being of silver or nickel, or in some instances gold. An axial section of the reflector surface is a parabola.

If a paraboloidal reflector is made within reasonable manufacturing tolerances it will more than fulfill all reflector requirements for automobile purposes for the reason that the source of illumination is not a point but an area of considerable magnitude.

The support of the reflector within the lamp housing is a very important matter if the direction of the cone of light emitted is to be restricted or confined to a certain area. The average reflector is supported by three or four hooks which also hold the lamp door. Fig. 1. Holding the reflector to its support by a number of screws is the most logical method of securing a permanent position. Fig. 2.

The socket adjusting device, otherwise known as the focusing device, is the most important detail in the design of a headlamp. It permits or should permit a forward and backward movement of the socket along the reflector axis, in order to place the source of light in proper relation to the reflector. One of the almost universal defects of headlamps is the limited socket adjustment. In some lamps the possible adjustment is about one-half what it should be, so that satisfactory results are obtainable only from a specific size and type of bulb.

A number of 1917 cars are fitted with headlamps in which the possible socket adjustment is so limited that it is impossible to properly adjust the bulb with respect to the reflector.

There are various types of socket adjusting

devices and methods by which they are supposed to lock or maintain the socket in position.

The external adjusting type includes all devices that permit of socket adjustment without opening the lamp door or disturbing any other part of the lamp.

The rim adjusting type includes all devices that permit of socket adjustment at the rim of the reflector. Fig. 3.

The bulb adjusting type includes all devices in which the adjustment is obtained by pushing, pulling or rotating the bulb. Fig. 4.

The rear adjusting type includes all devices which operate from the rear of the reflector and which require that the reflector be removed to make the adjustment. Fig. 5.

While the socket adjusting device is the most important part of the lamp it is unfortunately most frequently defective. Lost motion in the socket adjusting device not only makes it difficult to properly focus a lamp but permits the vibration of the car to alter its position.

The bulb adjusting type is undesirable because if sufficiently stiff to retain position there is a tendency for the vibration to loosen the bulb from its base. This is true particularly of those devices in which the adjustment is obtained by rotating the bulb. It is not unusual in the use of this type of device for the bulbs to break in the course of adjustment

and cause injury to the hand in spite of the use of gloves.

Another defect of the bulb adjusting device which is not generally understood or appreciated is the lost motion in the device itself or between socket and bulb base. This lost motion permits displacement of the light source radially, i. e., out of the reflector axis. A very small displacement of this character will distort the beam to a considerable extent and cause a very distressing light distribution. Any socket adjusting devices which require or permit of radial displacement of the source of light should not be tolerated.

Because of the difficulty involved in securing proper focusing and in some cases proper aiming, with any type of socket adjusting device not readily accessible without partly dismantling the headlamp, devices of this kind are not to be recommended. It is difficult enough for the layman to secure correct adjustment without his having to dismantle, and perhaps incorrectly assemble, the headlamp to do it.

There are two general types of headlight bulbs known commercially as the "B" and "C" types. The B, or vacuum type, contains a tungsten filament generally in the form of a helix. The average axial length of the coil is approximately 15/64 in. and the maximum diameter 9/32 in. In the early types it was necessary to anchor the filament to protect

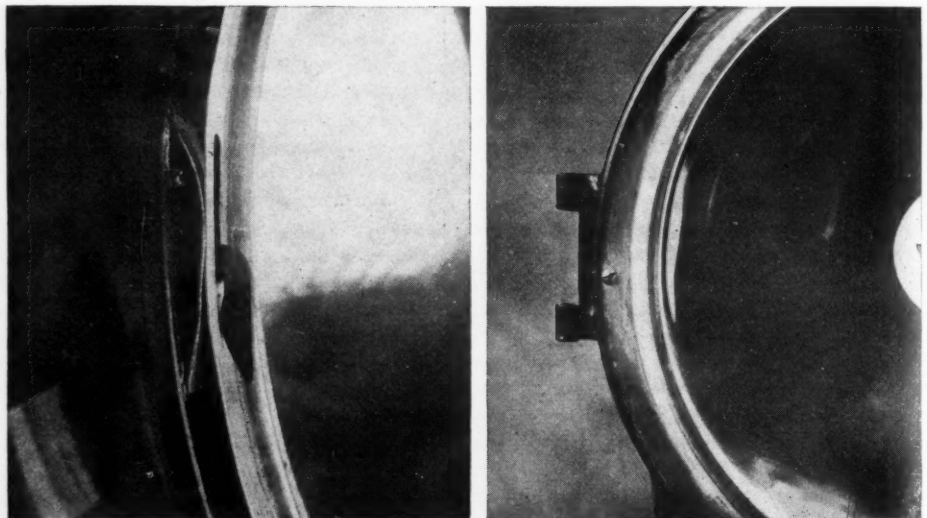


Fig. 1—left—Hooks support the average reflector. Fig. 2—right—Screws, however, are more logical.

it from vibration, but refinement in the methods of manufacture increased the strength of the filament and made the anchorage unnecessary.

The C type is a recent development which produces more light for a given current consumption than the B type. The C type bulbs are filled with an inert gas, one object being to put a slight pressure on the filament so that it can be raised to a higher temperature without undue filament evaporation, which is one of the factors determining the life of a bulb.

Envelope Generally Spherical

The globe or glass envelope of a headlight bulb is generally spherical in form, the two sizes used for headlight purposes being respectively $2\frac{1}{8}$ in. and $1\frac{1}{2}$ in. in diameter. Various other forms of globes have been made from time to time with different ideas in view. The advantages gained by the use of a tubular or straight sided bulb, aside from a question of stray light, are more imaginary than real. The shape and size of the globe are referred to by letter and number. For example "G" indicates a globular form and the number following it indicates the number of eighth inches in the nominal diameter thereof, thus: A G-12 globe is a round or globular envelope, $1\frac{1}{2}$ in. in diameter.

The shape of the filament of headlight bulbs has been modified from time to time. If the area of the filament is small the image produced by the lamp is correspondingly small. On the other hand, if the area is exceedingly large the image will be large but of considerably less intensity.

Considerable influence has been brought to bear upon the manufacturers of headlight bulbs from time to time in an endeavor to make a bulb which will eliminate some of the difficulties in obtaining a proper focal position. It is essential, however, for the lamp manufacturer to see that the focusing device has sufficient forward and backward movement. With the average automobile headlamp, I find from experience that if its focusing device had undergone the same refinement as the bulb there would be little if any trouble in obtaining proper results.

The peculiar construction of the type C or gas-filled bulb filament permitted the latter to be formed in various shapes. It is only within the last year that the bulb manufacturers have made any experiments to ascertain the resultant beam of light when bulbs of different filament shapes were placed in an automobile headlamp. The result of these tests brought about the almost universal adoption of the V-type filament.

What Focal Length Is

The focal length of a bulb is the distance from the center of the filament to the filament side of the anchor pins, which has been standardized as $\frac{3}{8}$ in. Bulb manufacturers have been able to keep the focal length within a very close tolerance. One detail of bulb manufacture, the importance of which has only recently been realized, is the necessity of placing the center of the filament in the axis of the bulb base. With the B type of filament covering a rather large area, this item was not considered seriously, but with the small concentrated type C filament it becomes an important factor in the attempt to get a uniform beam of reflected light from the headlamp.

The first important operation after placing the bulb in the socket is the focal adjustment. This adjustment depends upon the form of the reflected cone of light desired. Previous articles describing the operation of focusing a headlamp contained no set of terms to designate the different results. As it is practically impossible for the average person to determine the location of the center of the filament with respect to the focal point of the reflector, any description based on the focal point of the reflector is indefinite. I have

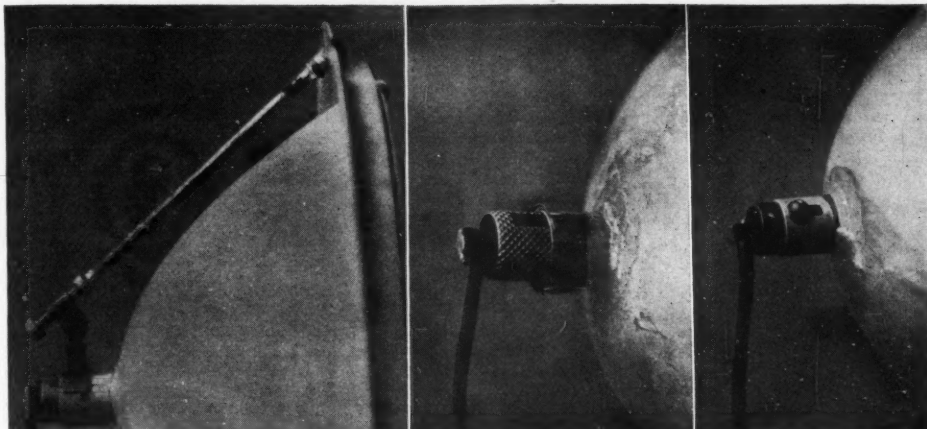


Fig. 3—left—Rim adjusting type. Fig. 4—center—Bulb adjusting type. Fig. 5—right—Rear adjusting type.

found it desirable therefore to refer to the focal position of the bulb by the image the reflected light makes on a screen, fence or other plane surface perpendicular to the axis of the lamp at a distance of not less than twenty feet.

Images may be obtained from the same lamp in two ways, namely, by diverging rays and by converging rays, as will be seen by reference to Figs. 6-9. Starting with the filament of the lamp placed back of the focal point we have an image with a black spot in the center, Fig. 6. This adjustment is undesirable because the light distribution upon the road is such that black spots are apparent. The majority of the rays in this case are useless because the wide angle of projection carries them considerably off to the sides and up into the air.

The next adjustment is that in which the filament of the lamp is moved slightly forward so that the black spot is eliminated, Fig. 7. This adjustment is known as the large image adjustment and gives the greatest angle of unbroken light. Again moving the filament slightly forward we get an image the diameter of which is considerably smaller, but as the cones of light projected from the reflector partially overlap we get a second or smaller and concentric image but one of greater brilliancy, Fig. 8. By moving the filament forward until its center is slightly forward of the focal point of the reflector we find that the two images observed in the previous position now completely overlap and make one image of maximum intensity, Fig. 9. This is the smallest image that can be obtained by a focal adjustment unless the area of the filament is decreased.

Since following the S. A. E. standard the distance from the center of the filament to the edge of the base is made $\frac{3}{8}$ in. in all headlamp bulbs, and since the center of the G-16 $\frac{1}{2}$ globe is $1\frac{1}{2}$ in. from the edge of the anchor pins, the center of the filament is $\frac{1}{2}$ in. from the center of the bulb. It is sometimes impossible to correct this difference in the G-16 $\frac{1}{2}$ globe for the reason that in some cases the globe itself is so very close to the apex of the reflector that the focal adjustment back of the focal point is limited. This results in a diverging beam of light which cannot be brought within proper limits.

In the G-12 bulb, $1\frac{1}{2}$ in. in diameter, the filament is approximately in the center of the globe so that the image of the filament reflected from the globe surface is almost coincident with the filament itself. The slight difference in position makes the filament appear to be of a slightly different shape or slightly larger in area.

As the focus of the reflector is a point, it is evident that only one point of the filament of the bulb can occupy this position, and rays

emanating from this point, after reflection, will proceed in lines parallel to the axis of the reflector. Rays from all other points of the filament, however, will be reflected from the reflecting surface at an angle to the axis. This is the reason why each point on the reflector reflects the image of the filament and sends out a cone of light. The cones emanating from points on the reflector near the apex have bases of considerable area while those reflected from points near the edges have small bases. Fig. 10. The resultant beam is a blending of these cones and the illumination produced depends entirely upon the form and area of the filament.

Direct Light is the light which comes, without being reflected, directly from the filament. It illuminates the road and the sides of the road directly in front of the car. That portion of the direct light which rises above the axis of the lamp is practically useless and in the case of momentary glare tends to prolong the effect. Painting a portion of the globe with an opaque paint so that the filament of a bulb in the lamp cannot be seen above the axis of the lamp will eliminate useless direct light. See Fig. 11.

In the case of the spotlight all direct light should be eliminated by the painting method. This will eliminate the light thrown upon the hood and mud guards of the car. This method makes it impossible to see any but the reflected light and the diffused light of the reflector, the latter being too small an item to be considered.

Importance of Focal Adjustment

The importance of proper focal adjustment has been explained, but there is one item of great importance which is generally neglected or overlooked, namely, the position of the filament with relation to the axis of the reflector. Radial filament displacement is shown in Fig. 12.

While defective sockets or socket adjustments are generally the cause of this displacement the fact must not be overlooked that the axis of the filament is not always placed in the axis of the bulb base. Well made lamps have little or no lost motion in the sockets, and bulbs as a rule have only a very slight variation in the position of the filament. There are, however, cases too numerous to mention of defective lamp and bulb construction. Some bulbs, especially the Ford type, are either made with the axis of the filament displaced from the base axis, or it becomes so displaced from the effect of vibration, burning over voltage, or both. The result of this displacement is a distorted image which unfortunately has a tendency to raise the beam of light.

On a foggy night it is particularly noticeable that the headlamps on cars are not properly aimed. Fully 50 per cent of the lamps

are projecting the rays of light so that little of the light strikes the roadway. I believe this is due to ignorance rather than to carelessness. I have in mind one car owner who purchased fourteen different types of bulbs in order to improve road illumination, when the chief difficulty was that the lamps on his car were so aimed that hardly any of the light fell upon the road. It is only recently that proper attention has been paid to the aiming the headlamp. In the majority of cases headlamps are aimed so that the front glasses are aligned with the rest of the car simply as a matter of appearance. In a number of cases the brackets supporting the lamps will not permit of any adjustment or alteration, such as Figs. 13, 14, 15 and 16. This often results in inefficient road illumination, and is one of the causes of glare production. It is natural for the owner of the car to assume that the lamps have been set to give maximum efficiency, but this is frequently not the case, although some manufacturers do take pains to see that the light projected is kept below the 42 in. limit. Had every car manufacturer followed this practice the glare problem would not have arisen.

Public Should Choose More

Until the public becomes as particular about the design and construction of the head lamps of a car as it is about the type of carburetor or ignition system employed, defective lamps will doubtless continue as standard equipment. This is a matter that can be largely controlled by the motor car buyer if he will insist upon proper construction. The manufacturer of automobile headlamps is only too willing to turn out a lamp of proper design and construction providing, of course, the automobile manufacturer will pay a fair price for it. But as long as the lamp manufacturer is called upon to furnish two headlamps and one tail lamp at a price of less than \$3 per set, we cannot expect a product that will give more than a partial control of the projected light. Headlamps are receiving less attention by engineers than almost any other accessory on the car.

Before considering in general the methods employed in glare reduction we may summarize the details of design that should be given more careful consideration.

Reflectors should be permanently attached to supports by screws.

Socket Adjusting Devices. At present most socket adjusting devices are faulty and must be made more secure. Bulb and rear adjustment should be discarded.

Sockets must be made to closer tolerances and must be located with their axis in the axis of the reflector.

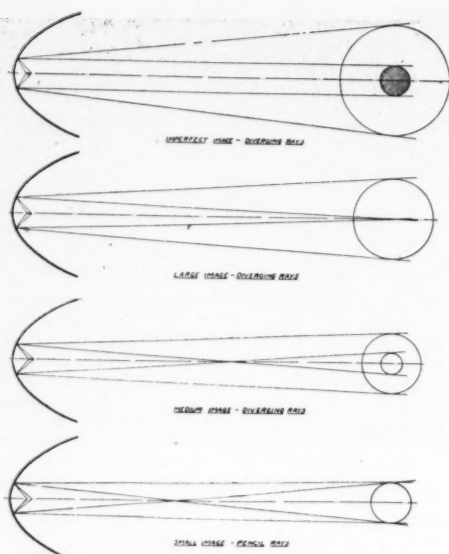
Bulb. The G-16½ bulb should be discarded. The filament of the G-12 bulb being located near the center of and in the axis of the bulb make it far more satisfactory.

Filament Shape. The coil filament is best for general results.

Correct aiming of headlamps is most important.

Filament Area. Only such bulbs as have a filament area complying with the S. A. E. standard should be used.

The problem of the regulation of glare from automobile headlights will never be solved until we determine absolutely upon what basis it is to be attacked. Various laws are based upon entirely different conditions and under these conditions the glare from a headlamp varies. Glare depends not only on the actual candle power and intrinsic brilliancy of the source but also upon the illumination of its environment. This illumination varies from the brilliantly lighted city streets to the dark country roads where the effect of glare will be found at its maximum. I therefore propose that in considering automobile headlamps from the glare standpoint all tests or



Figs. 6-9—Reading from top to bottom—
Different methods of obtaining images
from the lens of a lamp

comparisons be made with the headlamp in an environment of absolute darkness. If this form of test be made standard we have started the simplification by eliminating one confusing variable.

It is regrettable that the numerous methods of conducting tests of devices for reducing glare have resulted in considerable confusion. This is the result of a lack of system in determining the conditions under which the devices are to be tested. Unless some standard form of test is devised we shall continue to read conflicting reports of the same device or method.

I suggest the following methods of test: if the devices are to be tested out strictly from the motorist's point of view then two cars, equipped with the same device and operated under identically the same conditions of bulb, voltage, candle power, and focal position, should be used. The cars should be made to pass each other on an absolutely dark road at various speeds and the contrast between the road illumination of one car and the glare from the lamps of the other car should be the means of determining the efficiency of the methods employed. The speed of the cars is a factor of no little importance. The psychological effects of passing glaring lamps at the rate of 5 and 30 m.p.h. are entirely different.

The confusion incident to the problem of regulating glaring headlights is caused by the attempt to discover a method or means for the absolute elimination of glare without reducing to any appreciable extent the road illumination. This is practically impossible, as the ultimate solution of the problem must result in a compromise between the value of the road illumination and the glaring effect produced by the lamps. For instance, if the diffusion method is adopted there cannot be sufficient illumination on the road without causing disastrous glare effects when near the car. If the deflection method is adopted a certain amount of momentary glare due to the position of the car must be permitted in order to gain the advantage of proper road illumination while at the same time, by limiting the height of the beam of light, preventing glare probably over 85 per cent of the time the headlamps are in use. In suggesting any means for glare reduction which may possibly be adopted in future laws, another things must be remembered: the effectiveness of the law depends upon the manner in which it can be enforced by the average officer. Therefore simplicity of regulations is much to be desired. The simplest method of determining glare reduction will be most effective

because of the great probability of universal enforcement.

At the same time in seeking simplicity and freedom from highly technical requirements it is unwise to allow regulations to drift into vagueness or ambiguity. The motorist wants to know precisely the limitations of the law. While he has every intention of complying with the law he also wants the best road illumination the law will permit. A source of light of one candle power will cause the effect of glare if of sufficient intrinsic brightness. Therefore the specification "Must not glare or dazzle" is most vague. Until we have a standard unit of glare measurement we must not tolerate such vague requirements.

All devices or methods for glare reduction are based on one of two principles or a combination of both: namely, the reduction of light or the limitation of the light zone.

The methods of light reduction may be classified as follows:

- (a) Dimming the light.
- (b) Change in color of light.
- (c) Diffusing the light.

Dimming the light is accomplished by lowering the voltage of the circuit at the bulb, either by means of a rheostat or series connection, which reduces the candle power of the bulb. This, however, does not alter the light distribution, so that dimming the light to the extent that at the point of maximum illumination there is no effect of glare makes a light useless for road illumination.

There have been attempts to reduce glare by the change in the color of the light, but I have yet to learn of any real success with this method. Any reduction in glare by this method may be caused by the loss of light due to the absorption by the color screen or glass.

Effect of Light Diffusion

Frosted bulb, frosted front glass, diffusing screens or so-called "lenses" diffuse light and the diffusion of light from a source over a much larger area produces a secondary "source" the intrinsic brilliancy of which is less than that of the primary source. In the case of frosted bulbs, for example, the light from the small area of the filament is diffused over the surface of the bulb. The surface of the diffusing screen should be increased with any increase in the candle power of the bulb. The effectiveness of the diffusion method therefore depends upon the candle power of the light source and the area over which the light is diffused. Any variation in the current passing through the filament of the bulb itself changes the effectiveness of this method.

For example when a Ford engine runs at high speed the generator produces a voltage such as to give a light of the greatest intrinsic brilliancy. A screen which will diffuse this light properly will make the light at ordinary speeds of the engine practically useless as a road illuminant. Facts such as these make it apparent why it is unwise, not to say unsafe, to issue a certificate covering a specific type or make of glare reducing device. For example, a screen or so-called "lens" used on a lamp with a 20 candlepower bulb may absorb enough light to reduce the glaring effect sufficiently. But if the owner change to a bulb of higher candlepower, as he is very apt to do when so much light has been absorbed which should be used to illuminate the road, the lamp at once becomes glaring, although the certificate protects the owner from police interference.

With the diffusion method the light distribution on the road gives a brilliant foreground with no distant illumination. The contrast between this brilliantly lighted foreground and the poorly illuminated background makes night driving at any high, or even moderate speed dangerous and tiresome to the eyes.

A serious objection to the diffusion method is the fact that any reduction of glare at a

distance from the car is added to the effect of glare when near the car. Supporters of this principle have suggested laws the wording of which is such as to overlook this serious defect. This adds to the confusion regarding non-glare legislation.

Limitation of light zone includes means for:

Cutting off light ordinarily outside of zone where light is required.

Tilting of lamps.

Deflection of lights.

Modified reflectors for bulb or headlamp.

Cutting off portions of the light by means of opaque devices or of paint on the bulb, reflector or front glass may reduce the beam candlepower by 50 per cent or more. This of course is rather poor engineering practice. Furthermore, this method is effective only when the bulb is in proper focal adjustment. For example, if the upper half of the front glass is painted then the bulb must be focussed to project a diverging beam. Should vibration cause the bulb to move forward sufficiently the beam will become converging, all road illumination will be lost and the unrestricted light directed upward.

The Cheapest Method

Without doubt the simplest and cheapest effective method of glare reduction is tilting the headlamps. While the light distribution upon the road is limited in certain respects it is far more effective than any of the previous methods discussed. While it is essential that the bulb be focussed properly the percentage of useful light on the road is very high.

Deflection of the light is accomplished by the use of prismatic glass fronts which tend to redirect all or a part of the reflected light. The re-direction of the light in some devices not only keeps it within the zone where glare is not objectionable but also distributes it over a greater width of road. It is an advantage therefore to use a device of this character irrespective of the existence of glare regulations.

Satisfactory results can be obtained by the use of a modified reflector composed of two half paraboloids the axis of the upper one being so inclined as to throw the light toward the ground. In another form the bulb is partly surrounded by a reflector of peculiar form, so arranged as to cut off the direct light and so deflect it that it will be thrown upon the road. Both of these devices are an advantage in that they increase the illumination of the roadway at a point where it is most desirable to have good illumination, and prevent the light from rising above the 42 in. limit when properly applied. Care must be taken, however, to see that the filament is properly focussed.

The Most Effective

The principle of the limitation of light zone has been endorsed by various organizations, including the Society of Automobile Engineers. It is the most effective from the motorist's point of view because it reduces glare with the least loss of useful light and in most applications increases the amount of light upon the roadway. It is the method most readily covered by a simple and easily understood ordinance, an ordinance which is not only effective in accomplishing the desired result, but with which it is easy to comply and which it is correspondingly easy to enforce. When once properly applied any change of voltage or candlepower of bulb, providing proper focus is maintained, has no effect upon its effectiveness. Bulbs of almost any candlepower may be used without altering in any way the light distribution of glare reduction.

Unlike the diffusion method there is less glaring light near the car, and this is an important item where two cars are passing on a narrow road.

One of the greatest factors of safety in

night driving is the projection of light some distance in front of the car. It acts as a warning to others approaching the highway from intersecting roads of the presence of an automobile coming in another direction.

The projection of light at the side of the road when the automobile is making a turn is a warning to others around the turn that a car is approaching. With the diffusion methods this factor of safety is eliminated.

If the percentage of momentary glare from lamps deflected so that the light zone is limited, on a level roadway, to 42 in. from the ground is too great, it may be lessened by limiting the height to 40 or even to 38 in. from the road at a given distance from the car.

ILLUMINATING ENGINEERS MEET

Chicago, March 17—Suggestions for quick and easy means of determining whether or not a motorist's headlamps come within the specifications of the headlight glare ordinance, of any municipality, were the features of a paper entitled "The Headlight Glare Problem," presented by J. R. Cravath, inventor of the Cravath lens as manufactured by the Osgood Co. This paper was presented last night before the Chicago Section of the Illuminating Engineers Society.

Mr. Cravath remarked that ordinarily the enforcement of the ordinance as now on the books of most cities depends on the personal opinion of the police officer on beat and consequently there could be little

or no conformity in its enforcement. In his paper he suggested a test-shed or dark-room in which the lamp may be tested by simply running the car into the test-shed and comparing its light at definite points with that of a standard light by a simplified method of photometry. Mr. Cravath's paper is reproduced in part below:

The dangers and annoyances due to interference with vision caused by the glare from powerful automobile and locomotive headlights is now generally recognized wherever such headlights are in use. The problem is how to reduce or eliminate this glare without so much reducing the useful illumination given by the headlight to the driver as to cause another equally dangerous and annoying condition.

Naturally the first question is, What causes and constitutes glare? The 1915 Committee on Glare of the Illuminating Engineering Society, under the chairmanship of Dr. P. G. Nutting, agreed upon certain definitions of glare which in effect were that glare is a bright light within the field of vision of such character that it causes (a) eye fatigue, (b) annoyance, (c) interference with vision or reduction of ability to see clearly, sometimes called "blinding effect."

Where Chief Interest Lies

As far as the automobile headlight problem is concerned, we are chiefly interested in glare insofar as it causes the last of these effects, that is, interference with seeing clearly, although the other two are worth considering.

Can glare be completely eliminated in connection with the headlight problem, or must we be satisfied with some kind of a compromise? In a strict technical sense there is some inconvenience and interference with seeing if a light of very low candle-power is almost in line with objects we are attempting to see, whenever the surroundings are as dark as they commonly are at night on roads where headlights are needed. It is not, therefore, reasonable to suppose that we can absolutely eliminate glare in its technical sense, and the problem is, therefore, to reduce it to a reasonable minimum.

On a very well lighted street there is little need of a headlight as far as the driver is concerned, and on such streets its principal function is to act as warning to other drivers and pedestrians. Experience both as pedestrian and driver has convinced me that it is a mistake to depend altogether on very low power side lights as a warning of the approach of a vehicle.

Since it is upon country roads that the driver needs most light from his headlight, and since it is amid these dark surroundings that a given candle power of light would cause the most pronounced glare, the problem on the well lighted streets may be said to take care of itself if we can reach a satisfactory solution for poorly lighted streets and roads.

Glare Cause Simple

Although there are some problems connected with glare which have been very incompletely studied, there should be no mystery or confusion about what causes the glare in the case of headlights of the common parabolic type. As far as I know all competent authorities who have studied the subject are agreed that in practice headlight glare is caused simply and solely by the high candlepower of the beam of light entering the eye. Whether the effect on the eye varies directly as the candlepower or as the square root of the candlepower as stated by some authorities, is of little practical interest. The big practical consideration that outweighs all others is that with automobile headlights we are usually dealing with a beam of light of 1,000 to 50,000 candle power, and the eye cannot be subjected to such a

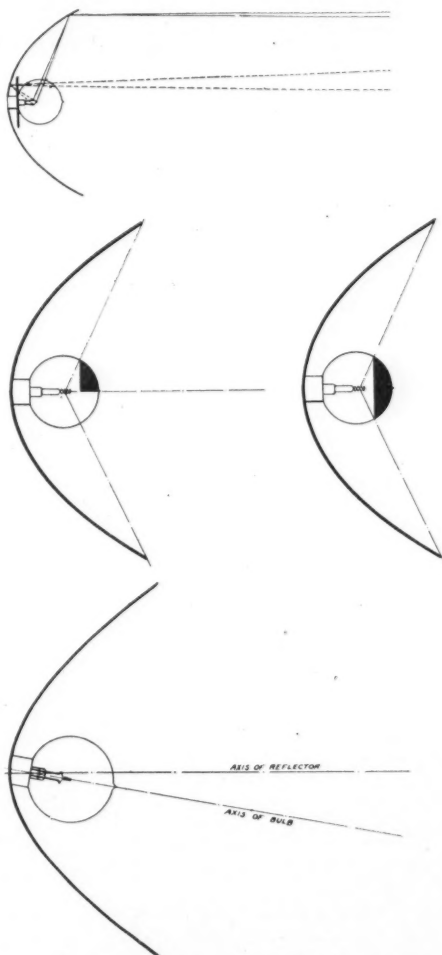


Fig. 10—top—Adjustment that gives one image of maximum intensity. Fig 11—center—Painting the bulb to eliminate useless direct rays. Fig. 12—bottom—Radial displacement of filament

beam amid dark surroundings without interference with vision. It should be obvious that anything which reduces the candle power of the beam entering the eye, with a given set of surroundings, reduces the glare effect. The problem is therefore practically one of keeping the candle power of the beam of light entering the eye as low as possible.

The Parabolic Reflector

The parabolic reflector, which is the one most commonly used for headlights, is so shaped that with a point source of light all of the rays from the source striking the reflector would be reflected forward in perfectly parallel lines and the beam would not diverge. The incandescent lamp filament is not a point source of light, and this, together with inevitable inaccuracies in manufacture and assembling, will cause a slight beam divergence even with the lamp filament as near the focal point as possible. If the lamp filament is adjusted slightly back of the focal point all rays from the reflector are divergent, causing a spread of the beam. If the lamp filament is adjusted in front of the focal point there is a crossing of the reflected rays in the beam and the effect again is a diverging or spreading beam.

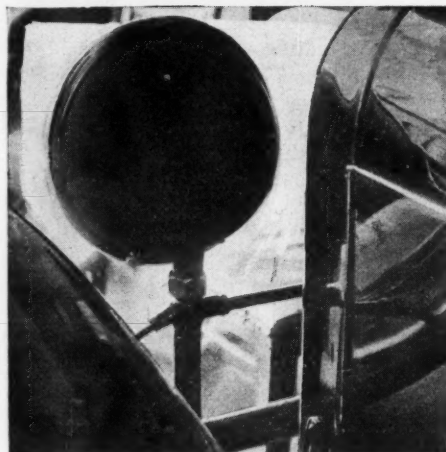
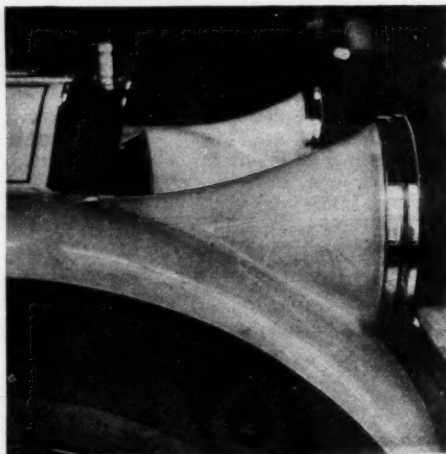
With a gas-filled automobile headlight lamp and a beam 6.5 ft. in diameter 29 ft. from the lamp the candle power within this main beam of light from the reflector was found to vary as much as 60 to 1 within the distinctly defined beam. Variations of 30 to 1 near the center for closely adjacent spots are common. The intensity of illumination falling on the eye at bright spots in the beam may be 1,000 times that received direct from the lamp. To practical intents and purposes the effect of the reflector is to magnify the image of the lamp filament many hundred times as it appears to the eye looking into the headlight from a point in the beam.

Two radically different methods of reducing glare by reducing the candle power of the beam entering the eye have been used. In fact almost all of the methods tried may be classified under these two general heads:

First Method

The first of these is to simply reduce the candle power of the beam by diffusion or dimming. While the details of these methods differ considerably, and they may be subdivided into various classes, they all have one point in common, namely, that the light on the road is reduced in about the same proportion as the light thrown above the horizontal plane where it may cause glare.

The second class of methods aim to eliminate glare by retaining the concentrated reflected beam of light in some form with its desirable high power, and so to direct this beam that it will fall upon the road and on low objects without rising to a level where it will cause glare. While there are objections to this method as described later, my study of the subject has convinced me that this general method, if properly carried out, offers the best solution of the difficulty. It is less satisfactory to the driver than lighting objects ahead to full height, but to paraphrase an old saying, the driver cannot scatter his glare and confine it too. Limiting the beam height is necessarily a compromise in that there will inevitably be some possibilities of glare with such a method, caused by the tilting upward of the beam due to road inequalities and during short intervals when rounding the crests of hills or at sudden changes of grade. However, if the top of the main beam is kept below 42 in. on a level road as specified by the Massachusetts Headlight Law and in some other proposed laws there will be annoyance from glare but a very small percentage of the time. It is better to permit temporary glare of this kind and get a good road illumination which this methods of treatment



Figs. 13-16—Brackets that do not allow any adjustment or alteration of the lamps

makes possible than to eliminate glare by reducing the candle power of the main beam of light down to a point where it neither causes bad glare nor gives the driver enough light to see where he is going. It is on long, straight stretches of road with deep ditches on each side that headlight glare from motor cars is likely to prove most dangerous and annoying, and on such roads glare caused by road unevenness would be least.

A complete description of all of the proposed devices for eliminating headlight glare would fill a volume. Only a few typical devices of the two general classes mentioned will be taken up as illustrating the different principles.

Methods of Diffusion and Dimming

One of the commonest under this head is that of simply cutting down the candle power of the headlight lamp by introducing resistance in the circuit or connecting them to a lower voltage. This, of course, is effective in reducing glare but very crude. One of the most popular schemes on high-priced cars is the use of an auxiliary small lamp in the top of the parabolic reflector, which, being small and out of focus, does not cause much glare. The amount of useful driving light is, of course, very small.

Other attempts consist in the use of transparent colored glasses of various kinds. They cut down the glare simply by reducing the candle power of the beam. In this connection a popular misconception should be corrected.

One frequently sees devices in which the center of the headlight glass is made nearly opaque, leaving the outer rim clear or nearly so. Since the concentrated beam of light which causes glare comes from any and all parts of the reflector it is evident that glare can be received from the outer part of the reflector which is not obscured.

This brings us to another class of devices which reduce glare by diffusing or scattering the main concentrated beam of light. The use of ground glass is a common and typical example of this. This glass acts to spread and scatter the beam so that it covers a much larger area and is consequently reduced in intensity. The loss of light by absorption of the glass is not serious, possibly 20 to 25 per cent, but the scattering of the beam is serious as far as its effect on the intensity and usefulness of the driving light is concerned. By this scattering action of a diffusing ground glass lens the illumination on the road within the area covered by the concentrated beam where the most powerful illumination is needed is reduced 80 per cent and more, depending somewhat upon the spread of the concentrated beam under consideration and the particular point in the beam. This reduction of intensity is, of course, due to the fact that the light flux of the beam is spread out so as to cover a greater area. Spreading the beam to cover five times the area naturally reduces its intensity to one-fifth that over the smaller area. From the standpoint of glare this method of diffusion has a serious defect in that it decidedly increases the candle power and the consequent glare at angles considerably removed from the axis of the reflector. For example, in one test which I have before me, made by Prof. E. H. Freeman, of Armour Institute of Technology, a headlight with plain glass front focused so as to give only 97 candle power at an angle of 7 deg. away from the axis showed 200 candle power with ground glass. At 9 and 11 deg. the ground glass showed 162 and 122 apparent candle power while the plain headlight gave only 15 candle power received direct from the lamp, which is too small to be worth considering.

The use of diffusing glass, therefore, while

it reduces the distant glare considerably, increases the glare in the eyes of a driver who is close up and about to pass. At 100 ft. the glare with ground glass is quite likely to be worse than with clear glass unless the lamp is very much out of focus with the clear glass.*

The diffusion and scattering of light rays by ground glass is due to an infinite number of very small irregularities of the glass surface. Some other types of diffusing lenses make use of much greater irregularities and do not scatter the beam quite so much. Of these common Florentine office partition glass is an example which is very similar in its action to the Warner and Prismolite lenses. There is, of course, more glare with these than with ground glass.

Methods of Beam Control

Methods of reducing glare by keeping the level of the concentrated beam below the eye level, as already explained, seem to the writer, after considerable study, to be unquestionably the proper lines of attacking the problem. This method is not without its difficulties, as will be discussed later in connection with accuracy of manufacture.

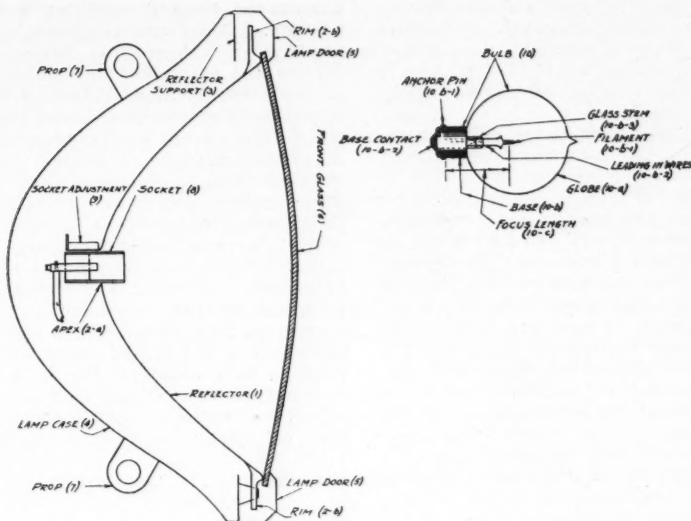
While these beam control methods differ among themselves in merit, they are all, in my opinion, superior to diffusion or dimming because of the greater distance ahead at which objects can be seen.

When the writer first considered this subject several years ago it then seemed that the accuracy of beam control required to make this method worth anything would call for an almost unattainable concentration of filaments and accuracy of manufacture of the various parts making up the headlight. Present practice, however, has put this method within easy reach, although it is not quite as easy in application at the present time as it probably will be within a few years when manufacturers and garage men have become better educated as to standards of accuracy required.

In considering this method of glare elimination the first question that is likely to occur to the technical man is that which occurred to the writer when he first began the study of the subject. Why not put the lamp at the focus of the reflector so as to get a concentrated beam and then tilt the headlight slightly downward so that the upper edge of the beam is either level or slightly inclined downward? I believe numerous technical men have advocated this. The practical difficulty which has been overlooked in this connection is that a beam so concentrated is too narrow to satisfactorily cover the road for driving purposes. The maximum concentration usually attainable with an automobile headlight is a divergence of about 4.5 deg. corresponding to a beam about 8 ft. 4 in. in diameter at 100 ft. distance. This is surrounded by a less bright beam of large diameter but not a source of bad glare. There are few roads so good and straight that a narrow beam of this kind is satisfactory. Curves and side ditches are fully as much to be considered as possible obstructions or holes in a straight-away road.

Broadening Beam

The next question is: why not broaden out the beam by putting the lamp out of focus and tilt the headlight a little more so as to keep the top of the beam below the glare level? To do this would require much more tilting than is now common, but this is not an objection if the method is otherwise satisfactory. When the beam is widened enough to illuminate a sufficient width of road it is, of course, increased proportionately in height and the great amount of tilting necessary to bring the top edge of the beam below the glare level brings the lower edge of the beam up close to the car. The result is that altogether too much of the



Nomenclature of motor car lamps

light flux is expended on the nearby portion of the road, which might better be utilized on the more distant portions, where the illumination is dim at best. There is another bad effect when the intensity is too great on the nearby road. The eye automatically adapts itself to the bright road nearby and that at a distance is not seen well. On a street where high candle power street lamps are placed at very infrequent intervals everyone has noticed how difficult it is to see far past a street light as long as the brightly illuminated area under the lamp is within the range of vision. When one gets past this area one can see much farther ahead. Both physical and physiological reasons therefore call for distributing as much of the light flux as possible to the distant portions of the road, leaving the nearby portion to be taken care of by direct light from the lamp. However, one must work between quite narrow limits, as an attempt so to direct the light as to light too far ahead on a level road will cause too much glare due to road irregularities and motion of the vehicle.

One of the commonest methods heretofore of securing beam width without too great height has been that of cutting off the top half of the beam. If the lamp is placed behind the focus the upwardly directed rays of the beam come from the upper part of the reflector and consequently any kind of screen which stops the light of the upper half is effective in cutting off the upward rays. The home-made method is to blacken or put paper over the upper half of the glass. Another method is to put a cap over the upper half of the lamp. One non-glare lens uses obstructing prisms across the upper half of the glass.

When the lamp is placed ahead of the focus so that there is crossing of the rays the upward rays which produce glare come from the lower half of the reflector and consequently obstructing the lower half of the glass or putting a cap over the lower half of the lamp cuts off the top half of the beam.

In either of these methods just described the intensity of light on the road is only one-half of what it would be if the whole reflector could be utilized to cover the same road area.

The merging of the top into the bottom of the beam can be accomplished either by the use of a prismatic lens as designed by the writer and described later, or by an offset reflector in which the top half is set slightly back of the bottom half. The lamp is then set so that it is ahead of the focus in the top half and back of the focus in the bottom half with the result that most of the rays have a slightly downward trend. Of course, the re-

sults obtained depend altogether on the relative setting of the two parts of the reflector with reference to each other and the lamp.

Various types of prismatic glass fronts or lenses have been used to accomplish beam control. Several of these employ horizontal prisms for the downward deflection of part or all of the beam. The type of prismatic lens which is simplest in design is one employing horizontal prisms of the same angularity from the top to the bottom, such as made by the Corning Glass Works in the past.

The Legalite lens, which is another type using horizontal prisms, accomplishes three things; the deflection of the entire beam below the horizontal, increase of beam vertical dimensions, and widening of the beam. All of the beam passes through prisms which deflect rays downward. However, the middle prisms deflect less than the bottom and top prisms with the result that there are two beams merging into each other. The upper beam comes from the middle prisms and the lower beam from the top and bottom prisms. Widening of the beam is accomplished by a cylindrical surface on the front, the prisms being on the back.

The Conaphore

A later type of Corning lens, known as the Conaphore, designed, I understand, by our fellow-member, Dr. H. P. Gage, has horizontal deflecting prisms which deflect all the rays from top to bottom of the beam about equally, so that the vertical dimension of the beam is not altered. The width of the beam is increased so that it is oval instead of a perfect circle. This widening is by means of a number of small cylindrical "fish scale" lens surfaces on part of the prism surfaces. The correctness of an oval beam is shown later.

The lens designed by the writer last year and now being introduced by the Osgood Lens & Supply Co. was designed upon a principle which appeared to be a fundamental for a successful non-glare headlight giving the maximum satisfactory road illumination, namely, that the beam should be wide enough thoroughly to cover a road and at the same time as low in vertical dimensions as the lamp, reflectors and glassware available make practically possible. The reason why the width of the beam should be considerably greater than its height has already been discussed in connection with the use of a round beam as from a common headlight tilted downward.

The less the vertical dimension of a beam within practicable limits, the less the amount of light flux which must be wasted on nearby portions of the road where it is not needed. After considering these factors it

seemed that the best result should be obtained with a lens which would accomplish the following three things: (1) light deflection below the horizontal; (2) flatten from a round to a long oval or rectangular form; (3) widening.

The lens which accomplishes these results is designed for use with the lamp slightly back of the focal point. The back face of the lens consists of a set of horizontal prisms of increasing angularity and deflecting power from bottom to top. These prisms are calculated to refract the upwardly diverging rays from the upper half of the reflector sufficiently to merge them into the downwardly diverging rays from the bottom half. This accomplishes the desired flattening. To accomplish the widening the front of the lens has concave cylindrical surfaces, which, to obviate too great glass thickness at the edges, are made in two stages. The result is a beam, which, when projected against a vertical surface, is about twice as wide as high. To a certain extent it is fool-proof as regards improper focusing, because if the lamp is placed ahead of the proper focus a very high narrow beam results, which should be so unsatisfactory to the driver that if he pays any attention whatever to focusing he will hasten to correct the trouble.

With all devices of this class where accurate beam control is essential, proper focusing is, of course, important, and too much emphasis cannot be laid upon the importance of educating users and garage service men to proper headlight focusing. The majority of automobile owners do not know that there is such a thing as focusing a headlight. Education on this is badly needed all along the line.

Width of Beam

The width of beam with this lens is about 21 to 23 ft. at 100 ft. distance. This is probably wider than many would consider necessary from theoretical consideration of the subject and in fact is wider than the writer first thought was best when making this design, but later developments and practical trial made the width mentioned seem best for all-around average conditions. With the reflector axis horizontal the brightest spot in the beam is $3\frac{1}{2}$ deg. below horizontal. In practice in the majority of cases there is a still further downward deflection due to the fact that the majority of headlamps are tilted slightly downward and this was recognized in the design of the lens.

Measurements made by Profs. Freeman and Snow, of Armour Institute of Technology, on a beam from this lens as compared to a circular beam of the same width from the same lamp and reflector equipment with clear glass shows that the average apparent candle power of the beam below the axis of the reflector was 2,110 for the Cravath lens as against 1,210 for the plain glass. This increase of average beam intensity of about 74 per cent is, of course, due to deflection of the light flux of the upper part of the beam into the lower part. The beam intensity was found to be about nine times that with ground glass.

Accuracy in Manufacture

If there is to be accuracy in the control of the beam of light it is essential that the headlight be properly pointed; that is, that the axis of the reflector shall point somewhere near right both vertically and horizontally. The lamp filament must be centered accurately with reference to the socket, and the socket with reference to the reflector. As far as lamp manufacture is concerned, efforts are now being made by the standards committee of the Society of Automotive Engineers to correct variations in filament position. There is also talk of so standardizing lamps and reflectors that focusing will be unnecessary; in other words,

having the lamp filament at a fixed focal position. For reasons already given, this would give a beam too narrow for good driving and precludes the possibility of some of the other methods described being used to eliminate glare. The movement to secure accurate centering of filaments in reflectors is, of course, very desirable. Accuracy of reflector manufacture is also desirable. These points are up to the lamp and reflector manufacturers. A third point which is still more important to judge from the actual conditions existing today is up to the automobile manufacturer. This is in the pointing of the headlamp. During my studies on lens design I had electric headlights on one hundred automobiles measured as they stood on the level streets at various places in Chicago to determine the actual conditions prevailing as to the pointing of headlights. Measurements were taken by holding a plumb line in front of the headlight face and noting how much the headlight was out of plumb in its diameter. The results were as follows:

MOTOR CARS

Both headlights tilted down.....	67
One headlight down and one up or plumb	28
Both headlights pointed up.....	5
Total	100

LAMPS

	Number	Percent
Tilted down.....	162	81
Tilted up.....	28	14
Plumb	10	5

The cars comprised a large number of makes just as they came along the street. There was no particular uniformity among the cars of any one make. The results in general indicate that manufacturers aim to have headlamps pointed slightly downward in most cases. There is considerable chance about whether it is actually done or not. The lamps varied all the way from perfectly plumb to 1 in. out of plumb, both up and down. A large number were from $\frac{1}{4}$ to $\frac{3}{4}$ in. out of plumb. The same irregular conditions doubtlessly exist as to the horizontal pointing and it is the exception rather than the rule to see a car whose headlights properly cover the road.

It is useless to expect that automobile frames upon which headlight arms and brackets are mounted can be assembled accurately enough to result in properly pointed lamps. Considering all of the possible inaccuracies in the assembling of an automobile frame its headlight supports and the headlights themselves it would seem that about the only way to secure proper pointing, which would be cheap enough to be workable except on very high priced cars, would be to depend on final inspection and adjustment after the car is completely assembled and to provide some cheap and easy way of adjustment. On cars where headlights are supported on arms of sufficient length to permit bending a simple bending probably offers the best solution. On cars where the headlights are mounted on short lugs or built into the guard the problem is not so easy, but these are mostly higher priced cars on which more time can be spent. Headlight adjustments of this kind must be made in the dark or at least not in broad daylight and must be made with the actual beam of light from the lamp rather than from any external measurements which do not always take into account the internal assembly of the headlight. However, external measurements alone would improve the present conditions considerably, as can be judged from the figures given.

Legislation

Headlight laws cannot be said to be in satisfactory shape either as to their speci-

cations or means of enforcement. They are, however, generally better than nothing, because they usually make it possible to arrest and fine the worst offenders. In this connection the writer has the following suggestions to offer.

The fundamental difficulty with legislation so far has been that it does not define what constitutes the dangerous or blinding or dazzling glare, which it attempts to prohibit. It is left to the judgment of the enforcers of the law to define this. While all would agree as to very bad glare without measurement, there should be some definite specifications, susceptible of exact test, to apply to cases where the offhand judgment of different people would vary; and it will vary over a large range.

There is a simple way to define the amount of glare permissible and that is in the maximum candle power of any beam that can enter the eye above a glare level of 42 in. As to the candlepower limit to be set tests should be conducted to determine this before writing it in the laws or regulations.

These tests should be made with both pedestrians and drivers on a dark street, to determine how much candlepower in the direction of the eyes can be permitted. The details and methods used in such tests should be carefully worked out by experts.

Once such a candlepower limit is set, the question of enforcement comes up just as it has come up with existing laws.

A law which simply provides for the approval of a certain device without regard to how it can be misused does not fully answer the purpose. As already shown, excellent devices can be mis-applied. Judgment should be based on results.

Following out this idea a headlight glare law would specify, for example, that there shall be no glare above a 42-in. level, 50 or more ft. ahead of the car with the car on a level road, and it would define the candlepower of the beam that is to be considered glaring.

Ease of Enforcement

Such a law could be more easily enforced than a speed law. An arrest by the policeman would necessarily have to be on suspicion, subject to a simple test with photometer when the offender arrives at a designated test station under charge of the court having jurisdiction over such cases. If the car does not carry devices which diffuse the offending beam, the policeman can quickly check up his suspicions before making the arrest by walking back 50 ft. and seeing where the upper edge of the beam strikes his body. If the road is level and a well defined beam strikes above 42 in. he can be reasonably sure he is justified in making the arrest. While a driver might manipulate things before arriving at the test station so as to change conditions he would not be likely to repeat his offense because of the inconvenience of such an arrest.

The idea of a test station may call up alarming visions of elaborate apparatus and a corps of expensive experts, but as a matter of fact such a test station could be devised that could be worked very simply, without experts in photometry, by the judge himself or any officer of the court, provided it were properly designed and installed and occasionally supervised by experts. This test station should also be available for any automobile owner to determine whether his equipment conforms with the law. An easily available and quick test of this kind should help materially as a preventative and educational measure.

Discussion of Cravath's Paper

The need for standardized regulations for headlight glare restriction was emphasized by Mr. Cravath in the summing up

of his paper in which he stated that if one were to comply with the ordinances of the different states and municipalities on a transcontinental trip he would have to change his headlights eighteen times between New York and San Francisco.

Another feature of the situation which was brought out by the chairman in his introduction of the discussion, was the affect of the color of clothes on the visibility of pedestrians and also the fact that none of the headlight regulations or suggested standard regulations, such as those of the Society of Automotive Engineers, when specifying the distance at which an object must be rendered visible by a headlight make reference to color. On this feature, H. A. Johnston of the Chicago Electric Railways stated that the headlight tests of that concern proved that a white man in light clothes became visible twice as far away as did a negro in dark clothes.

Engineer Flanagan of the Board Vehicle Headlight Inspection of the city of Chicago made the point that there had been 7000 arrests in Chicago for glaring headlights during the three years the ordinance

has been in force. He stated that the board had made 195 inspections of anti-glare devices and had approved approximately seventy-five of these devices.

One of the features of Chicago's anti-glare law which worked a hardship on motorists and tended to cause them to disregard the law was brought out by Darwin S. Hatch of MOTOR AGE in the statement that many of the violations could be traced to improper illumination or absence of illumination of the city streets and parks, by the city of Chicago and the park board.

He contended that inasmuch as the idea of the board of inspection was simply to assure that sufficient light was provided to act as a marker for the vehicle, without reference to its value as a road illuminator, providing there was no suggestion of glare, the board had passed devices under restrictions which prevented their supplying sufficient road illumination on dark streets. If the motorist use these streets, he would have to select on his own information a device which not only passed the board but also provide him enough illumination for driving right.

board of directors: W. C. Durant W. C. Sills, Nathan Hofheimer, L. G. Kaufman, E. R. Campbell, R. H. Higgins, A. H. Goss, H. M. Barksdale, E. O. Wood, and J. T. Smith.

DANES PROHIBIT CARS ON STREETS

Copenhagen, Denmark, March 14—The Danish government has prohibited temporarily the use of passenger cars on the streets. The gasoline and tire shortage has become serious and the government has taken this means to alleviate the situation. There are more than 30,000 cars in this country, so that with the present strict censorship by Great Britain on all shipments of cars, gasoline and tires, the scarcity of these motor necessities is apparent. Gasoline is selling at four to six times the price current in the United States. Few tires reach this country.

MOLINE PLOW CO. EXPANDS

Moline, Ill., March 16—When the addition to the main building of the Moline Plow Co. tractor plant is completed, about April 1, work will start immediately on a new building for storing stock. That portion of the plant originally designed as a stock room is being utilized for machinery. The present plant is capable of turning out from eighteen to twenty tractors each day. The plant has reached the maximum of construction since the first of the year, and orders can not be filled as rapidly as received. The first tractor was turned out July 1, 1916, and plans were made to turn out from six to eight a day, but the production soon was increased.

VELIE PRODUCTION INCREASES

Moline, Ill., March 17—The Velie Motor Vehicle Co. is preparing to double its output for 1917 and plans to produce more than 10,000 cars. Already 40 cars are being produced daily. This increased output has been made possible by the installation of a progressive assembly system and requires but few extra men. The frames are carried from overhead through the center of the assembly room. At one stage the engines are swung into place; at another, the rear axle; and so on until all parts of the chassis are assembled. To care for the increased production, the wagon works are fast being absorbed, and it is predicted that by the end of the year they will have been entirely crowded out by the motor car plant.

FINAL BANKRUPTCY DIVIDENDS

Detroit, March 16—Final payment dividends in the case of the bankrupt Briggs-Detroit Co. were mailed to creditors this week. The distribution amounts to \$3,700, which is 17/100 of 1 per cent of the total claims. The total distribution amounts to \$45,000 to preferred creditors and \$81,000 to general creditors. Total claims against the company when it went into bankruptcy, June 28, 1916, were \$485,000. Total realized assets were \$143,432.

Thirty-Five Models Are Higher Now Increases During Last Two Weeks Prophecy Advances by Other Makers

NEW YORK, March 20—Special telegram—The prices of motor cars quietly increased in the last two weeks by advances ranging from \$25 to almost \$1,000. Nearly twenty-five passenger car and truck prices have been raised to date, but it was expected that there would be a large readjustment to take care of the big increase in the cost of materials. The following increases have gone into effect:

CAR	MODEL	OLD PRICE	NEW PRICE
Allen	.....5 pas.	\$ 850	\$ 895
Allen	.....7 pas.	850	895
Austin	.....7 pas.	3,750	4,000
Crow Elk	.....2 pas.	825	845
Chalmers	.....2 pas.	1,230	1,250
Detroit	.....2 pas.	1,195	1,250
Detroit	.....5 pas.	1,195	1,250
Detroit	.....Coupe	1,375	1,525
Detroit	.....Detach. top	1,398	1,550
Metz	.....2 pas.	545	600
Metz	.....5 pas.	545	600
Franklin	.....2 pas.	1,800	1,900
Franklin	.....5 pas.	1,850	1,900
Franklin	.....Coupe	2,650	2,750
Franklin	.....Sedan	2,750	2,850
Locomobile	.....2 pas.	4,750	5,150
Locomobile	.....5 pas.	4,600	5,000
Locomobile	.....7 pas.	4,600	5,000
Locomobile	.....Limou.	5,600	6,200
Locomo	M-7.....2 pas.	5,400	6,050
Locomo	M-7.....7 pas.	5,400	5,950
Locomo	M-7.....Limou.	6,500	7,200
Paterson	.....2 pas.	1,095	1,195
Paterson	.....5 pas.	1,095	1,165
Paterson	.....7 pas.	1,095	1,195
Peerless	.....2 pas.	1,980	2,090
Peerless	.....7 pas.	1,980	2,090
Peerless	.....Coupe	2,700	2,750
Peerless	.....Sedan	2,840	2,890
Peerless	.....Limou.	3,350	3,590
Singer	.....2 pas.	3,500	3,800
Singer	.....5 pas.	3,500	3,800
Singer	.....7 pas.	3,500	3,800
Singer	.....Limou.	4,600	4,750
Stutz	.....2 pas.	2,275	2,375

WILL STUDY JAPANESE MOTORING

Vancouver, B. C., March 16—Hi Sibley, special correspondent for MOTOR AGE,

sailed yesterday on the steamer Empress of Asia for Japan, where he will study motoring and motor trade conditions in the islands. Mr. Sibley's special articles on motor vehicles on the European battle fronts and with Pershing's punitive column in pursuit of Villa in Mexico, as special correspondent for MOTOR AGE, has made his work known to readers of this publication.

U. S. RUBBER TAKES PLANT

Bristol, R. I., March 16—The plant of the National India Rubber Co. has been taken over by the United States Rubber Co. The assessed value of the land and buildings is \$550,000. The plant employs 3500 operatives.

CHEVROLET DECLARES DIVIDEND

New York, March 20—Special telegram—The Chevrolet motor yesterday declared an initial dividend of 3 per cent, payable May 1 to stock of record April 20. President W. C. Durant predicted 1917 business in excess of \$80,000,000 as compared with \$33,000,000 in 1916. From Jan. 1 to March 10 this year the company shipped 21,875 cars against 10,068 in same period a year ago. The company has been cancelling for the last five months from 5000 to 12,000 orders at end of each month, which it was unable to take care of. Sales of cars in 1916 were 69,683, of which 50,048 were from sub companies and 19,635 were from affiliated companies. Following is the

Twenty-Four Exhibitors at Tri-Cities

Size of Coliseum Limits Displays, as All Dealers Cannot Be Accommodated

DAVENPORT, Iowa, March 17—Twenty-four exhibitors are represented at the Coliseum here this week. Nineteen are car exhibitors, and five are accessory exhibitors. Altogether, fifty-three cars are shown, twenty-eight touring, twelve closed, five roadsters, four chassis and four electrics.

There would have been more exhibitors at the show had conditions been other than they are. For instance, the Studebaker, Jeffery, Cadillac, Mitchell, Cole, Moon and Ford are not at the Coliseum but are having an "At Home" week with cars to transfer visitors to other salesrooms or to the Coliseum. The reason for this arrangement is that the Coliseum is too small. The dealers draw for space in the order of their years of membership in the Tri-Cities Automobile Trade Association of Davenport, Rock Island and Moline, which is holding the exhibition. As it happened, there was no space left when the members had been taken care of, and the non-exhibitors are not members.

Most of the non-exhibitors are not members because the association only admits members that have been in business for at least a year before making application and who apply ninety days before the show. Many accessory dealers also are holding their private exhibitions. The Coliseum would not hold all the dealers in the Tri-Cities.

Window Display Contest Held

To get the business houses to dress for the week the association held a window display contest for the merchants of the Tri-Cities. Nearly every window in the

three cities was decorated specially. About thirty-five stores entered the contest, for which there was a \$25 prize. Hall & Martin, art dealers in Davenport, won. They used motor car art posters and tires. Other stores received honorable mention, and the contest as a whole did much to make the cities in tune with the show.

The Clinton Dealers' Association observed its custom of attending the Tri-Cities show in a body and was present Thursday night. The Tri-Cities association gave a banquet for them, and show problems were discussed.

TO SHOW USED CARS

Milwaukee, Wis., March 17—The Milwaukee Automobile Dealers, Inc., will hold a used car show April 20-27. The auditorium, where the annual show has been held in January for nine years, will be used. The show is a temporary solution of the used car problem of Milwaukee distributors and dealers, following the decision of the association to postpone other means, such as forming a used car clearing house association, until fall.

LOS ANGELES ROW DOOMED

Los Angeles, Cal., March 15—Recent enactment of a city ordinance providing against the parking of motor vehicles on Olive street, and declaring that thoroughfare within the congested zone, was the final blow toward the dissolution of the street as the motor row of Los Angeles.

For many years Olive street has been the heart of the motor car industry. A dealer regarded a location on that street

as imperative to his success. The real estate men realized their opportunity and increased rents enormously at the expiration of each lease. The result was that one by one, for the last three years, new salesrooms have been put up in the district west of Olive street. However, several of the most important establishments have refused to remove, declaring their location too valuable an asset.

It has been the custom for dealers to use the street for parking demonstrating cars. With this as a start the parking evil began. Used-car dealers began lining the curbs with their offerings, and gradually the available space was so contracted that it was more or less dangerous to drive a car there. When some used-car dealers, whose stocks were so large they could not house them at night, took to leaving cars on the street over night without any lights on them, the city authorities stepped in and passed the ordinance that will mean the end of the street's fame as motor row.

SPEEDWAY FOR SAN FRANCISCO

San Francisco, Cal., March 16—A speedway, backed by the California Speedway Association, will be built near San Mateo. Active work on the course will start within a short time. I. R. Gates is manager.

STRIKE HINDERS BUILDING

Cleveland, Ohio, March 16—Motor car and parts makers are finding building operations completely halted by the builders' strike in this city. Plans to make additions to the Grant Motor Co. plant have been held up, and the delay in completing the Disbrow Motor Corp. factory prevents that concern from further activity. The Abbott Motor corp., which will move here from Detroit, is held up by the inability to complete its plant, and several additions to other plants are left unfinished. More than 20,000 members of the builders' trades are engaged in the lockout.

CANADA RESTRICTS U. S. TOURISTS

Montreal, Ont., March 15 — Strict requirements for the admission of cars of non-resident tourists are being made by the Canadian customs department. The 1917 rules provide that the American tourist must present his license permit at the Canadian port of entry. This will be accepted if his trip is not to exceed 24 hr. It will be taken by the collector of customs and retained until the owner recrossed the boundary, which he must do at the point of entry. A bonding certificate will be issued at the port of entry for anyone wishing to remain in the Dominion from 1 to 30 days, and this will be canceled at any port through which the tourist passes in leaving the country. A guarantee company's bond will be required from anyone remaining in Canada up to six months longer than the 30-day period. The bond will be canceled at the point where the non-resident motorist leaves,



What is it? It is called the Moore car and was taken at the Washington show with Miss Hilda Vann of the Crescent films, driver

and the canceled copy must be returned to the port of issue. Any tourist remaining in the country longer than the six-months' period must pay the 33 per cent duty and 7½ per cent war tax on his car. No Manitoba license is needed for a period of thirty days.

DART NOT IN FARM DEAL

Chicago, March 16—A note in MOTOR AGE issue of Feb. 15 stated that the Dart Motor Truck Co., Waterloo, Iowa, had been traded for Iowa farming property. C. W. Hellen, president of the company, is authority for the statement that the item referred to was erroneous. According to President Hellen, the Dart Motor Truck Co. has not made any such a transfer but one of the stockholders did trade about \$10,000 worth of his stock to apply on the purchase price of five Iowa farms.

The Dart Motor Truck Co. is still being operated by the same officers and directors as heretofore and it would take considerably more than this number of farms to purchase control.

TO MARKET SELF-CLEANING PLUG

Chicago, March 17—The Autocraft plug, formerly marketed by the Craftsman Corp., Chicago, has been purchased by the D. & D. Co., Chicago. It will be known as the D. & D. plug and is featured by a loose ball terminal designed to keep clean sparking points through vibration of the engine. This has been described and illustrated as the Autocraft plug in a recent issue of MOTOR AGE.

Demand Threatens Tractor Famine

Unforeseen Business Finds Nebraska and Western Iowa Jobbers Unprepared

OMAHA, Neb., March 17—The jobbers in this territory are facing a tractor shortage in Nebraska and Western Iowa as the result of the unprecedented volume of sales during the last few months. Dealers here and at Council Bluffs have received practically all the tractors they estimated would be necessary for spring sales demands, but sales have far exceeded this number in many cases.

Consequently, with the freight car situation what it is, the jobbers have come to believe that relief from the shortage will not come in time to be of any great value in spring farming, and this, therefore, will be done to a considerable degree by horses at the hands of disappointed farmers. With the efforts now being made by the jobbers, however, it is hoped to have the situation in such shape that the fall selling season will not only be satisfactory to the farmers but will eclipse anything dreamed of by the dealers themselves.

Even as it is, the jobbers have prepared for a record-breaking spring selling. They have worked during the winter months to good advantage, and the show here came at a time when all should have been ripe for a whirlwind spring campaign. It was with deep chagrin that the dealers watched the volume of business which they might have

had slip through their fingers for several months more just because they had not been adequately prepared for it. As it was, one firm sold 115 tractors here during the show week, while another sold eighty-five.

TRUCK OWNERS WIN

Chicago, March 16—Motor truck owners won their last skirmish in their fight against Chicago's truck fender ordinance to-day when Judge Fred S. Smith of the circuit court granted a temporary injunction against the enforcement of the city's truck fender ordinance. The Motor Truck Owners' Association, which has been fighting the ordinance as illegal, unfair and impossible to comply with, as well as dangerous to pedestrians, Wednesday filed a bill for an injunction. Judge Smith set March 27 for a final hearing.

A MILLION IN NICKELS

Winnipeg, Man., March 15—Jitney drivers in Winnipeg made \$1,000,000 last year. The nickel-fare passenger traffic has been systematized in this city, and that perhaps accounts for the success of the operation of such cars. There is a jitney owners' and drivers' association with offices



The number of cars parked at the curb shows why Olive street in Los Angeles, Cal., is breaking up as a motor row

where weekly meetings are held and applications received. Effort is made to detail drivers to routes of financial opportunity, and service is regulated.

The organization has 270 members. Summer traffic is expected to bring 600. Last year the operators paid out between \$50,000 and \$75,000 for repairs, between \$300,000 and \$400,000 for gasoline and between \$50,000 and \$75,000 for new cars. The average life of the jitney car is one year. Each driver uses 7 gal. of petrol each day and works 12 hrs. daily. From fifty to seventy-five mechanics are employed constantly to make repairs. From three to four sets of tires are used yearly.

DISBROW MOTORS INCORPORATES

Cleveland, Ohio, March 17—The Disbrow Motors Corp. has been chartered under the laws of New York and Ohio with a capital of \$300,000, fully paid in. Louis Disbrow is president. J. J. Curl is secretary and treasurer.

STEWART-WARNER PRODUCTS

Chicago, March 19—The Stewart-Warner Speedometer Corp., Chicago, is expected to add two more products to its line of motor car equipment soon. They will be known as the Stewart V-Ray searchlight and the Stewart Autoguard.

RUBBER OUTPUT BIG

Chicago, March 16 — Preliminary estimates of the world's rubber production in 1916 are that the output exceeded any previous year and that the increase was due entirely to the growth of the plantation rubber industry. Supplies of rubber from Brazil and other rubber countries show a reduction from a comparatively recent date. The total rubber output last year is given at 198,000 tons, compared with 153,555 tons in 1915.

STEGEMAN INCREASES CAPITAL

Milwaukee, Wis., March 19—The Stegeman Motor Car Co., Milwaukee, Wis., manufacturer of motor trucks, has increased its capital stock from \$100,000 to \$200,000. At the same time announcement is made that Joseph C. Millmann, secretary and treasurer of the company since its organization, has retired. His interest has been taken over by Oscar Stegeman, president and general manager, and L. G. Schertl, the latter taking Mr. Millmann's positions. Mr. Schertl also will be director of sales. Frank H. Parker continues as vice-president. Frederick Gettelman has become a member of the board of directors. The Stegeman company on March 15 moved into its new office and engineering building and within thirty days expects to occupy extensions to the machine and assembling shops, which will make it possible to handle between seventy-five and eighty trucks at one time.

Stagnates Truck Trade

Pending Legislation in California Stops Dealers' Business to Await Results

Distributors Report Loss of Sales and Threatened Bankruptcy

LOS ANGELES, Cal., March 15—Motor truck dealers here admit their business is practically stagnated as the result of pending legislation directed against motor-propelled commercial vehicles.

One of the largest distributors in the state to-day acknowledged the loss of a sale of five 5½-ton trucks, due wholly to unsettled conditions. He says he has at least twenty other prospective buyers who will not conclude their deals until something definite is done by the legislature. Another dealer, whose average business has been about four sales a week, said he had not sold a truck this month. A third said the proposed laws would compel him to quit business. All are exclusive truck representatives.

\$25 a Bus Seat

It is provided in one bill that each passenger-carrying bus must pay a license of \$25 a seat. Many of these buses with a capacity of twenty-four passengers are in service between Los Angeles and suburban towns. That would mean a tax of \$600 for each vehicle. In addition they must pay 4½ per cent of the earnings to the state railway commission, state and county tax on equipment, the state operator's license and a weight tax, or six taxes in all, which approximately would amount to \$1,250 a year.

Truck capacity is to be limited to 5 tons. There are many larger than this in use in the state, and instead of considering the purchase of additional equipment large operators are now thinking about how they can dispose of what they have. On a 5-ton truck the bill would levy a tax of \$350. In addition there would be a state license, weight tax and, in case the truck is engaged in general hauling, a city tax and the usual state and county property tax. This would amount to between \$650 and \$700 in all.

It is estimated that the oil companies operating in California are using 300 trucks equipped with tank bodies. When loaded, the truck, tank and contents weigh approximately 14 tons. Each outfit represents an expenditure of approximately \$4,000. None of these trucks can be used as now equipped if the bill becomes a law.

AN INVESTMENT THAT PAID

Elizabethtown, Ky., March 16—Hardin County considers that it has made \$500,000 with a \$50,000 investment since the construction of the Dixie highway through the county. Of this gain at least \$21,000 is

attributed to money left by the tourist. A count was kept of cars bearing licenses of other states in the seven months of the 1916 touring season, and 21,000 such followed the highway through the county. Though each car averaged four passengers, making a total of 84,000 tourists, the estimate of the money left in the county has been placed as low as 25 cents each.

Each Hardin County farm along the highway has increased in value \$10 an acre. About 240 farms have 2000-ft. frontages on the highway on either side. No consideration is taken of the saving to the farmers in transportation. Two years ago a motor trip from Elizabethtown to Louisville took all day for the 45 miles. That was before the present highway. Now one can motor into Louisville and attend the theater or concert and return the same night.

BRISCOE EIGHT HIGHER

Jackson, Mich., March 16—The price of the Briscoe eight-cylinder car will be advanced from \$985 to \$1,025 March 25.

HOLLAND PLACES CAR EMBARGO

New York, March 19—Special telegram—Holland has placed an embargo on motor cars. The Government requisitions all shipping space for food stuffs and no space is allowed for motor cars.

DEALER TO HANDLE AIRPLANES?

Chicago, March 17—The possibility of the sale of airplanes and airplane parts by a Chicago motor car dealer is suggested in the incorporation this week of Thomas J. Hay, Inc., with Thomas J. Hay as president, George C. Norwood as vice-president, J. H. Quinlan as secretary and George F. Friese as treasurer. Tom Hay is the Chandler dealer in Chicago, and the articles of the new incorporation include provision for the aviation manufacturer market.

JORDAN ANNOUNCES INCREASE

Cleveland, Ohio, March 15—The Jordan Motor Car Co., this city, has announced an increase in prices, effective April 1. The seven-passenger car and the sporting roadster are listed at \$1,795, while the four-passenger sport model with wire wheels, regular equipment, will sell for \$1,895.

DAVIS TO RAISE PRICES

New York, March 16—The Davis Motor Car Co., Richmond, Ind., will raise its prices \$100 April 1 on its models H, I, J, and J. I., with the exception of the Springfield Sedan which remains at its present price. The H and I models are at present quoted as follows: two-passenger, five-passenger and seven-passenger, \$1,195; coupe, \$1,595; sedan, \$1,795; and detachable top, \$1,995. The J model is listed at \$1,495 for both the five and seven-passenger types.

Golden Gate Motorists Boost Yosemite Highway

*Just a Hint
of the
Annual Touring
Issue
April 5*

MOTORISTS and good roads boosters of California are determined Yosemite valley shall be opened in the fullest sense of the word to everybody who wishes to enter, and to back up their assertions and determinations along this line they have for the last several months been crying long and furiously for another road into this, one of nature's storehouses of scenery. As a result of this demanding and boosting the prospects are that before a great while this proposed and much-needed road will be a reality. Four roads already lead into the Yosemite park — three on the west and the recently-

opened Tioga Pass road on the east, the western roads being known as the Wawona, the Coulterville and the Big Oak Plats roads. It takes a pretty good car and a fairly good driver to get over them, while there are grades on each of the roads, which call for mile after mile of low-gear work.

New Road's Virtues

It is claimed that the proposed road will make travel into the park a great deal easier on both motor car and driver. It will enable the motorist to enter the park on the level of the lower end of the park floor instead of climbing thousands of feet to get down to the park floor level. The proposed road is known as the Mariposa-El Portal highway. According to present plans this road will have its southwestern terminus at Merced, up to which point an improved road now exists. From Merced this road will follow the proposed state highway, which runs east from Merced to Planada, thence northeast to Cathey and then in an easterly direction to Mormon Bar, from which point it travels northwest to Mariposa. At Mariposa the proposed state highway, which is about 34 miles long, ends, and the route proposed by the Automobile Club of Southern California begins. This route, after leaving Mariposa, goes east to Briceburg, thence northeast to El Portal, covering a stretch between Mariposa and El Portal of something like 33 miles. From El Por-



What appears to be a road of higher bed than that to the left is really a fallen tree in Mariposa forest

tal the course continues in a northeast direction and after a few miles intersects with the old Big Oak Plats road, along which it continues into the valley. The route from Merced into the park is about



Yosemite park has its Baby Buntings, and this is one of the Baby Buntings who came over in the Mayflower, so to speak

82 miles long, and the most pleasing thing about it is that no grade along the entire route is greater than 5 per cent, while all other routes into the park have grades exceeding 20 per cent, some going as high as 25 and 26 per cent.

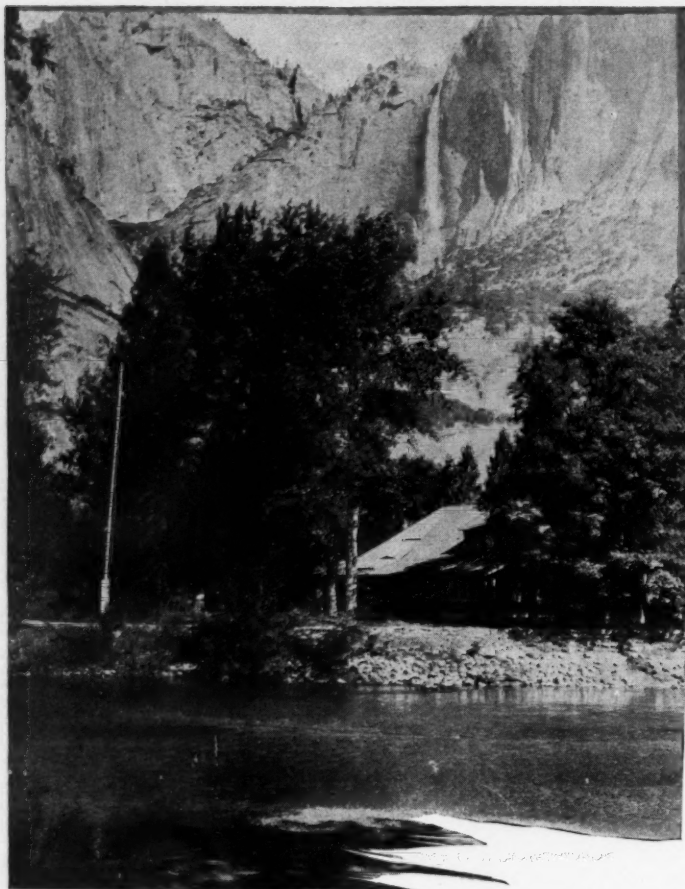
No doubt the motorists of California and, in fact, the entire nation desire to explore the wonderful Yosemite valley. This is proved conclusively by the increasing number of cars that come into the park each year. It will be remembered that not until 1913 was the park open to motor travel. Although the letting down of the bars was heralded with

delight by every motorist in the nation, only a handful of tourists dared make the trip during the first year. There were two reasons for this. First, the roads into the park were, comparatively speaking, untried; second, every car which entered the park that first year was entangled in so much red tape in the form of restrictions that only the optimist of the highest type and the dare-devil had the nerve to squeeze through.

Fewer Restrictions Now

Since 1913 things have changed in this particular section of nature's playground, so far as restrictions are concerned, thanks to the continued threatening, kicking and fighting of those heroes who weathered the first and second years, with emphasis on the first, along with a few other motor enthusiasts. The guardian soldiers have disappeared, and in their places efficient and courteous forest rangers are to be seen, these men having proved already that they are willing to meet the motorist a little more than half way. With this substitution of civil for military rule in the park there has been a wonderful improvement in the conditions to be found there. The motorist will invariably receive courteous treatment and accurate information. As motorists in general learn that the rules are becoming fewer and less rigid the travel in the park increases.

August, 1916, more than 30,000 visitors had gone into the park. These went in on foot, by stage, horseback and the



This is the Merced river, on the banks of which camping sites await the itinerant motorist. Camping outfits are rented in Yosemite village

privately owned motor car. Exactly 2716 private motor cars entered the park up to that time, and it is probable that these carried the greater part of the total of the park's visitors.

Park Travel on Increase

With regard to this increasing travel into the park, R. B. Marshall, superintendent of National Parks, says:

"Opening up this park to motorists has done much to increase travel. Fully 60 per cent of the tourists arriving there go by motor car. Everything possible is being done to keep the roads in good condition. Last year, for instance, we spent between \$275,000 and \$300,000 on a powerplant and good roads. If motor travel continues to increase at the ratio it has shown thus far, I have no hesitancy in saying that within five years the money derived from the motor fees and the various concessionaries will be amply sufficient to keep the road in good condition. Once they are built we will not have to ask Congress for appropriations to maintain them. I am very much surprised and delighted at the volume of travel over the recently-constructed Tioga Pass road. One thing which brings about this great travel is the knowledge among motorists that good accommodations may be obtained at the High Sierra lodges at normal cost."

No one expects that the proposed Mariposa-El Portal road will be chosen by



The tree "California" in Mariposa is familiar through much photography. It is one of the reasons why California, the state, contains so many boosters

everyone entering the park. On the contrary hundreds of motorists will be attracted by the other

routes for the simple reason of their scenic advantages, attendants to the stiff grades and the various high passes which carry the machine to the crest of the Sierra range at different points. Wonderful values in scenic way go hand in hand with the high altitudes. But it is claimed that hundreds, or even thousands, of car owners who do not care to push their machines

over the more difficult roads will select the route of less scenery and more comfort. The plan is to make it possible for those who do not prefer scenery to good roads to enter the park over a favorable highway.

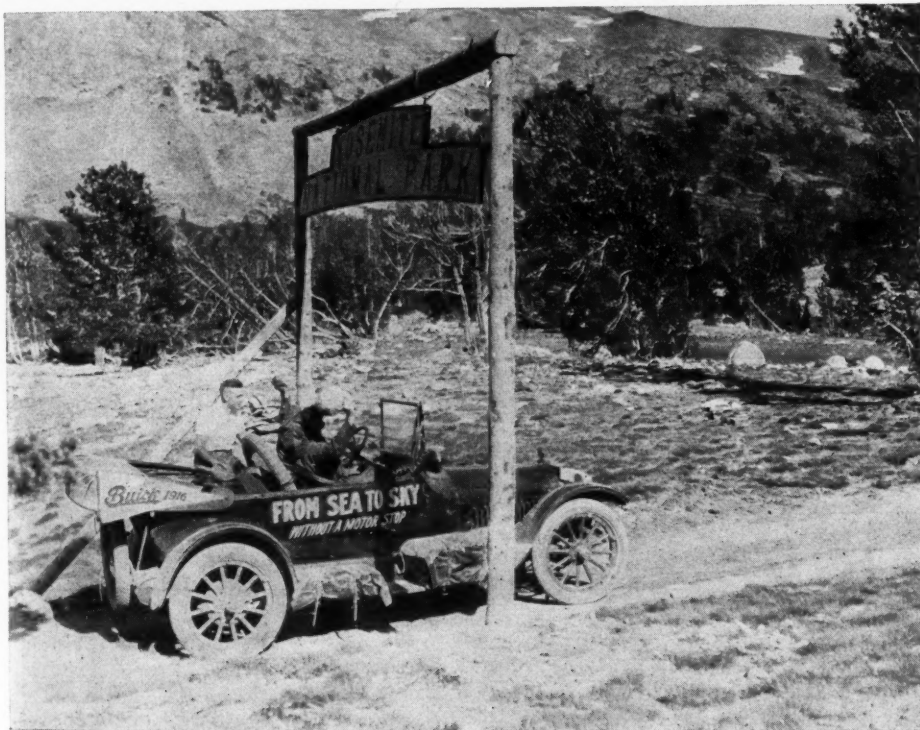
Almost level country is there, and it is claimed that so far as actual expense is concerned the cost of this road would not compare with the financial outlay in the construction of the roadways which now enter the park. So far as providing funds for the work is concerned, it may be said that this part has been taken care of. A



Not many fallen trees have as good a claim to royalty as this one. It can boast of a diameter of 20 ft.



A solid mountain of granite towers in the background, while close at hand is a quiet stream such as any wood might offer in less majestic surroundings



Yosemite park boosters equipped for following the available roads throughout their course, "from sea to sky," as their slogan tells you

short time ago the state of California voted bonds to the extent of \$15,000,000 for good roads purposes, and this Mariposa-El Portal road was named as one of the stretches that is to be improved.

The road will open to the motorist not only the Yosemite valley but also the Mariposa grove of big trees. This last named feature in itself warrants the construction of the highway, for it is one of the big attractions of California. A

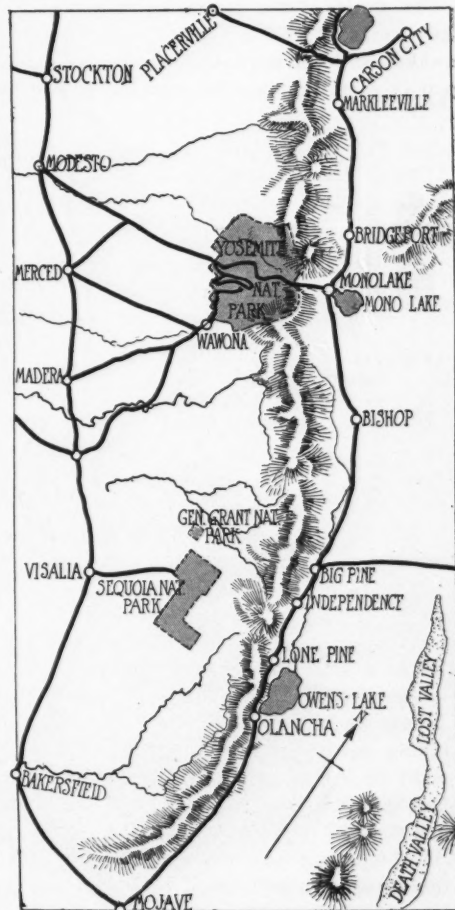
camping tour including both the Mariposa grove of big trees and the Yosemite valley would be one never forgotten. An important feature to be considered by the motorist who is also a camper is that if he does not care to go to any of the established camps and pay from \$2.50 a day up for a tent or cabin and three squares, he can camp in the truest sense of the word, for the Government has laid out a number of camping sites which may be

secured for the asking. Also, pipes bring pure mountain spring water to these camping sites. Complete camping equipment can be rented in the village of Yosemite, where camps may be set up right on the banks of the Merced river.

MORE MINNESOTA ROAD WORK

St. Paul, Minn., March 16—This is to be the biggest road-building year Minnesota has known. Taxes of more than \$8,850,000 for roads and bridges will be provided this year, the largest sum in the state's history. The last tax was \$7,885,790. This figure for 1917 is outside local paving assessments, license revenue and other revenues, which are expected to total with the previous figure more than \$10,000,000. This will be even larger next year when the cost of registration is increased from \$1.50 to \$5 for three years. Concrete and steel bridges are going in to replace wooden ones.

The grading of 1860 miles in Minnesota during 1916 at a cost of \$1,674,016 would reach by permanent grade to San Francisco, and surfacing with gravel and macadam and sand clay, costing \$1,063,346, would give an all-weather road from Twin-Cities to Washington, D. C. The 12,000 miles of state roads maintained in 1916 at a cost of \$726,427 is equal to four and one-half times the distance from Portland, Me., to Portland, Ore.

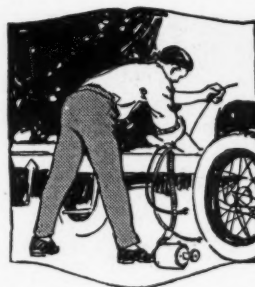


Map showing roads through central and eastern southern California, with access to parks



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the thirty-sixth installment of a weekly series of articles begun in MOTOR AGE issue of June 29, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the Class Journal Co., Chicago, in a size to fit the pocket conveniently.

The fundamentals of electrical circuits of the motor car were explained through their analogy to water systems, and the relations of current pressure and resistance were brought out. This was followed by an explanation of series and multiple circuits, how electricity is made to do work in lighting, starting, signalling, etc. Calculating the capacity of a battery for starting and lighting and the cost of charging storage batteries and determining the torque a starting motor must develop were explained. Action of primary batteries and dry cells was considered. A section was devoted to the makeup and action of lead and Edison storage batteries, and another to the care of lead batteries in service and the best methods of charging them. Magnets and electromagnetism then were considered, and the principles of generators and motors were explained. A section on generator output was followed by one on the purpose and operation of the cutout. The section on Engine and Motor Connection began March 1 and was preceded by one on Electric Motors.

Part XXXVI—Motor and Engine Connection—Location of Starting Motors

A NUMBER of different possible locations of the starting motor with reference to the engine and transmission are shown in Fig. 212.

The shaft of the motor, as shown at 1, is at right angles to the crankshaft of the engine and usually is connected to the crankshaft by a worm-and-worm gear alone or a worm-and-worm gear in combination with a second gear or chain. An example of

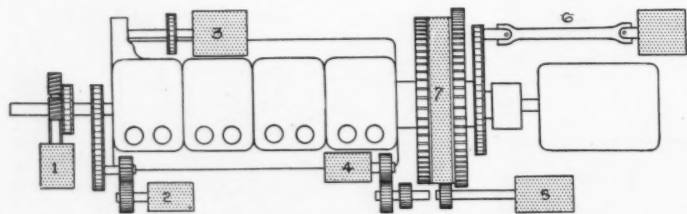


Fig. 212—Diagram to illustrate possibilities of starting motor location with reference to the engine and transmission

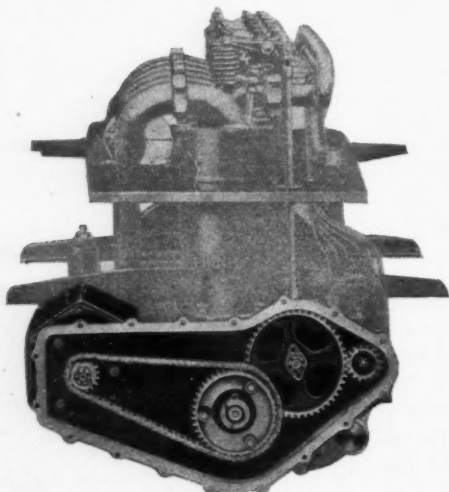


Fig. 213—Application of dynamotor made by the Dyneto company to the Franklin engine

the location of the motor in which the connection is by a worm-and-worm gear was shown in Fig. 199.

The motor may be located alongside the engine as shown at 2 in Fig. 212 and connected to the crankshaft by gears or a chain or perhaps a combination of the two. An example of this location of the motor in which the connection is made by a chain is shown in Fig. 213. Installation of a double-deck arrangement of motor and generator in the Saxon four is shown in Fig. 214.

The starting motor may be mounted in front of the flywheel as shown at 4 in Fig. 212 or it may be located behind the flywheel as shown at 5 in the same figure. In the majority of cases the connection is direct between the pinion on the motor and a gear cut in the surface of the flywheel or in a collar which is mounted on the rim of the flywheel. In some cases a chain or gear reduction is introduced between the motor shaft and the gear on the flywheel. The pinion on the driving shaft may be made to engage the gear on the flywheel by any one of the several methods previously described. The installation of the Bijur system on the Packard is shown in Fig. 215.

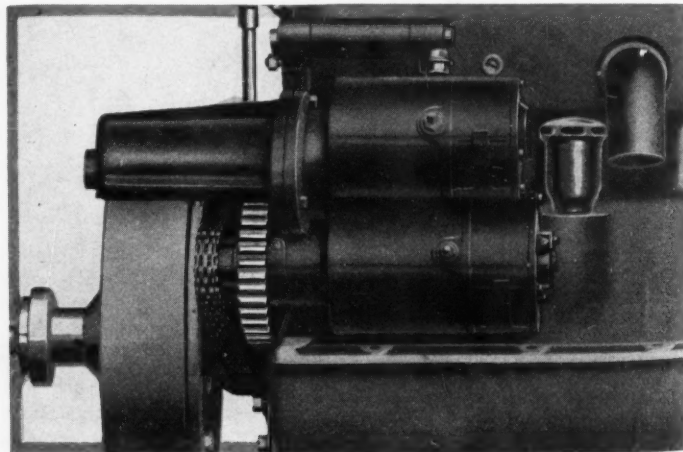


Fig. 214—Installation of double-deck arrangement of motor and generator in the Saxon four

The application of the Bosch flywheel starter to the Marmon is shown in Fig. 216. The pinion in this system is made to mesh with the gear on the flywheel by moving the shaft on which the pinion is mounted endwise. This movement is produced by the magnetic pull of the field of the motor on its armature which is normally off center with respect to the field as shown in section in Fig. 205.

The installation of a Westinghouse starting motor on the Chalmers six is shown in Fig. 217. The motor in this installation is mounted on the gear case and a bearing is provided in the flywheel case for the end of the shaft on which the pinion is mounted.

A representative starting motor as made by the Delco company for direct flywheel drive is shown in Fig. 218.

The method of connecting the motor, shown at 6 in Fig. 212, is decidedly different from any of the other methods thus far described in that it is connected to the transmission shaft, and power is transmitted from the motor to the engine through the friction clutch in the flywheel. An installation of this kind is found on the Reo car, it being manufactured by the Remy company.

The only example of the motor installation shown at 7 in Fig. 212 in which the electrical unit is installed for starting and generating purposes alone is that of the U. S. L. System. An example of the complete installation of this system is shown in Fig. 219.

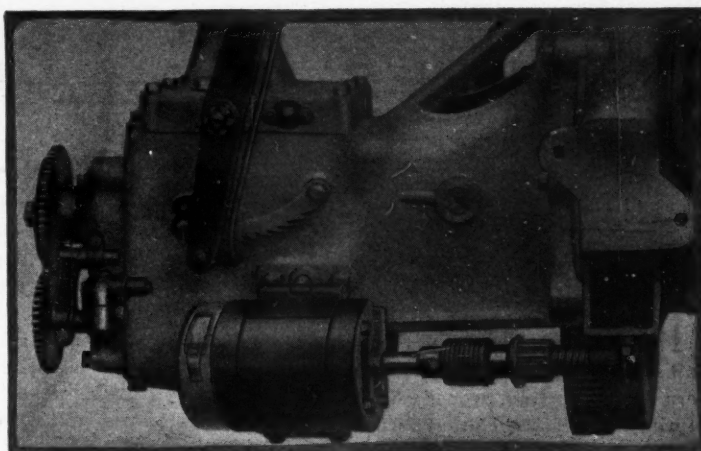


Fig. 217—Installation of a Westinghouse starting motor on the Chalmers six

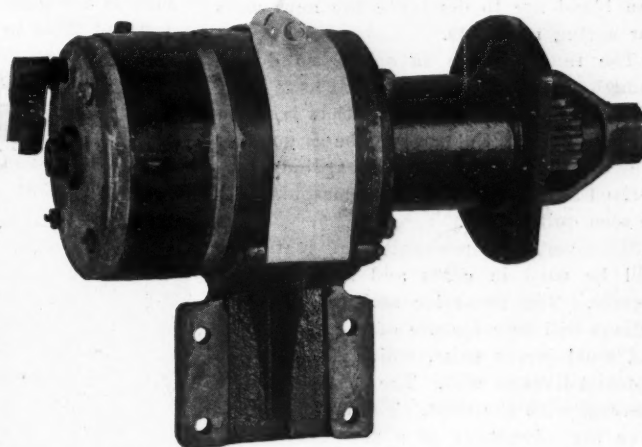


Fig. 218—Delco motor for attachment to flywheel case—a representative two-unit type

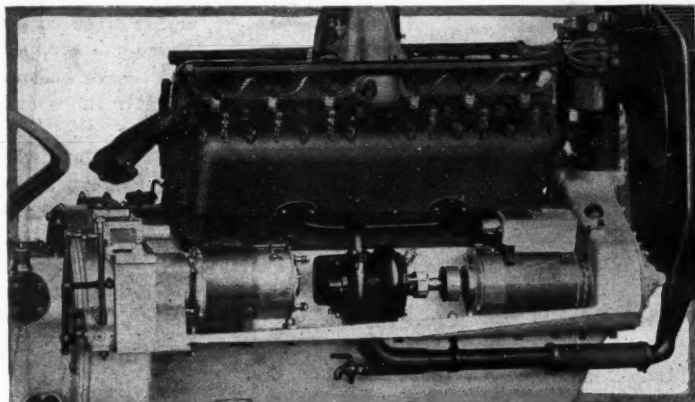


Fig. 215—Installation of Bijur system on the Packard

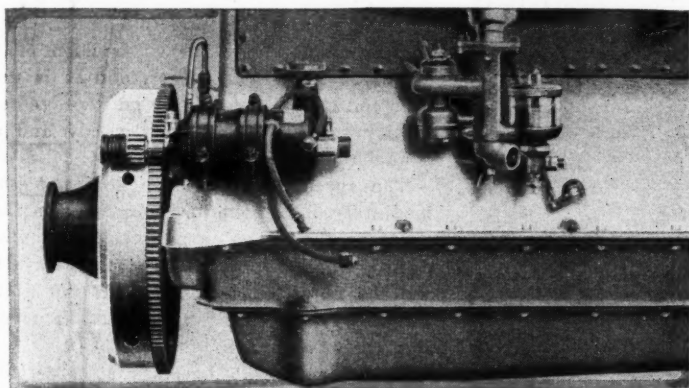


Fig. 216—Application of the Bosch flywheel starter to the Marmon

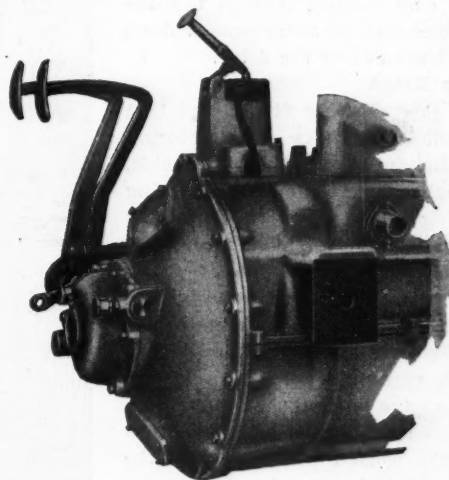


Fig. 219—Complete installation of U. S. L. dynamotor

MORE WILLYS-KNIGHT TAXIS

Toledo, Ohio, March 19—The Westcott Express Co., a taxicab company in New York, has ordered fifty Willys-Knight taxicabs from the Willys-Overland Co. for immediate delivery. The company has been trying two Willys-Knight limousines in taxicab service for the last five months. The contract calls for custom-built bodies, upholstered in genuine Spanish leather.

Among the taxicab companies now using

Willys-Knight are the Yellow taxicab companies of Toledo, Columbus, Cleveland and Cincinnati, who operate eighty; the La Salle Hotel taxicab company, Chicago, who operates fifty; and the Toledo Transfer Co., which has just contracted for fifteen more.

LYONS ATLAS TO MAKE TRACTORS

Indianapolis, Ind., March 17—Following its purchase of the plant of the Hume Mfg. Co., maker of farm tractors, the

Lyons Atlas Co. will add tractors to its products. The plant of the Hume company will be moved to Indianapolis from Hume, Ill., this spring, and the combined plants will be used in the manufacture of farm tractors, internal combustion engines and Diesel and gasoline engines. About 400 men will be added to the working force, making it about 1600. The company plans to make 5000 tractors this year, and to increase the number next year.



From the Woman's Viewpoint



Spring Comes Soon Says the Calendar

THIS is the month in which spring comes, according to our calendar, and all signs of snow and ice in the more northern regions failing, proper consideration of spring and spring clothes is due. To the motorist spring brings another chance to take the pick of the clothier's art for her use. For all the comfort and style that art can blend are to dominate the new coats for spring motorists.

The tans will be favorites, no doubt, though the brightest colors will have their advocates in the sports suit that is to be worn so much. Velours will be as good as they are this winter, while gabardines, rubberized and oiled silks and homespuns will be seen quite often.

Moreover, a combination of materials will be used in coats and suits and in dresses. The two-color and two-material scheme will be a feature of the sports silk and wool jersey suits, which the summer motorist likes so well. The coat may even contrast with the skirt. The motorist will have the advantage of a new fashion of wearing the coat that matches, or purposely mismatches, the dress, so the suit for a drive may change, through the discarding of the coat, to an afternoon dress on arrival at the end of the drive.

Stitching to Reign

The wide skirted, loose fitting coat that wears so well over frocks while motoring will retain the fullness belted at the side, the shawl collar and big cuffs. Stitching in contrasting colors will give distinction to the coat, while color will give other distinction.

In short, so much care has been given to the case of the woman motorist that there is no reason why she should not have every bit as much opportunity to dress as she would if she gave no time and thought to the car. You remember it hasn't been so long since the woman who ever took the wheel of a car into her own hands was considered unfeminine and somewhat of a freak in the way of clothing, which she was more often than not, owing to the universal nature of the misapprehension as to what a woman who drove, or even rode, should and should not wear.

Yards and yards of chiffon were considered absolutely necessary for seeing the motoring season through. And the impossible dusters. Nobody would ever have mistaken them for anything else but dusters.

To-day the coats are made of soft woolen that falls into easy lines and is pliable and comfortable. Some of them are cut on

military lines; others are as feminine as even the most feminine could wish. All are smart. They have that characteristic in common. For the longer drives the sports suit, with loose overcoat and snug-fitting small hat or cap, keeps the wind at bay. For the shorter drive there is even less attempt at disguise. All that the woman who drives to a tea or shop needs is a warm light coat; loose, pliable gloves that do not restrict the movement of the fingers; and a really comfortable hat. And such is her good fortune that she can to-day find these in the acme of their perfection.



Shawl collar, big muffs and pockets and much stitching—all are present in this coat designed especially for motorists by Giddings of New York

English Women Man Royal Flying Corps

ALL England has become interested in the Royal Flying Corps by the employment of women drivers for the corps' motor cars. The drivers are supplied through the transport section of the Women's League, which has its finger, so to speak, on every woman who is ready to take her place at the wheel of a car.

All who have ambition to join the driving staff of the Royal Flying Corps are supposed to be competent drivers, though it is not absolutely necessary that the would-be driver have a close acquaintance with the nature of the beast's mechanics. It is desired, however, that some mechanical ability be present, and it often is, for the women of England have not stopped at learning to run a car but have become efficient workers in the repair shops and garages.

Happy is the lot of the candidate who passes the red tape prevalent here as in other walks of life. First, she must have her name posted. To obtain this desired honor she must first satisfy the powers-that-be of her suitability for the post. So great is the supply of women drivers there is a waiting list, and on this waiting list goes her name, too.

Undergoes Driving Test

In due course, after her name has been posted on the waiting list, she is called up to undergo a driving test in London. The test is made under the supervision of a Royal Flying Corps officer, and it is understood that the candidate must prove her ability to handle both a Crossley and a Studebaker.

The successful candidate does not immediately obtain the desired goal. On the contrary she is put on probation a month, during which she does the same work she will be required to do later, if no hitch comes. When finally accepted she must sign on for a year.

The woman who becomes a driver in the Royal Flying Corps may be employed in any part of Great Britain. She may be transferred, and often is. And, even though she has contracted to drive for the Royal Flying Corps she may find herself called on to drive for the Army Service Corps sooner or later.

The job she obtains in this way is by no means a sinecure. She must report at 8 in the morning, and she works until 6 o'clock anyway. If there is any need, she must be prepared to remain on duty later than this. For this almost constant service she gets \$8.50 a week plus about 10 cents an hour for duty after 6 o'clock.

Each driver is entitled to three days off a month.

The women like their work, even though it is not always easy. It is interesting to them, and it also makes them feel they are freeing that many more men for active warfare.

The women drivers are turned out smartly in khaki with the letters "R.F.C." on the sleeves of their tunics and overcoats.

THE CLUB FEMININ AUTOMOBILE

The Club Feminin Automobile, as its name implies, is an organization of women motorists in France. To be specific, it is an organization of women motorists in Paris.

Men are only contributing members at this motor car club. The idea grew of a desire to mobilize the women who could and would lend their cars and services and would belong to a club that was a working motor car club. Eight hundred French women had permits to drive cars when the club was organized first, and to-day they are driving the fleets of cars that transfer the wounded and crippled soldiers of France from the hospitals of France to the great outdoors for a treat of fresh air.

The platform of the club is intended to make clear the aim of the organization to aid by transport of wounded soldiers or in any other service possible.

More than three thousand soldiers were given outings during the summer months in this way, with no accident to mar the pleasure given.

RIGHT HERE AT HOME

England and France are not the only ones who have learned the part their women can play in motor transport during war. Fifty women have enrolled in the corps of ambulance drivers organized in Chicago recently as a part of the women's section of the Navy League.

Miss Florence M. Spofford, an expert driver herself, is in charge of the examinations which the applicant for membership in the corps is required to pass. As soon as the corps is completed classes will be conducted in some garage where motor car emergency repairing will be taught first. Later actual driving on rough roads will give further experience.

The married women have pledged themselves to drive cars at home in case of war. The unmarried ones will go to the front in such a case if their service is necessary.

Among those who passed the examinations are Mrs. Frederick D. Countiss, Miss Dorothy Heafield, Miss Edith Sexton, Miss Loraine Cleary, Miss Florence Vaile, Miss Mary Stafford, Mrs. J. O. Hunnell, Jr., Miss Jessica Cady, Mrs. J. S. Barker, Miss Rosamond Goodrich, Miss Catherine Connell, Miss Edna M. Lowe, Miss Catherine Channon, Mrs. Marquette A. Healy, Mrs. Malcolm Fay, Miss Isabel Tucker, Miss Ida B. Moss, Miss Jessie Nickerson, Mrs.



Mary Anderson, her Scripps-Booth and her overalls

Augusta Jameson Greer and Miss Miriam Steever.

Another organization has been formed by women of Chicago and the suburbs for service in case of war. Most of the women own and drive their cars and know something of the mechanics thereof. Mrs. John B. Sardy of Oak Park is the president of this organization. W. G. Tennant, a Chicago dealer, offered an instructor, pro-

vided a class of fifty women was formed.

Miss Darcy Orde of Glencoe is chairman of the membership committee. New members are not required to own cars as it is the intention of the organization to have an auxiliary corps formed of women who do not own motor cars but who will become prepared to serve when necessary. In time of emergency the body will attach itself to the service of the Red Cross or of the Navy League.

Other officers are: Vice-president, Mrs. G. Adams, Chicago; secretary, Miss Marion Keehn, Kenilworth; and treasurer, Mrs. E. C. Morton. Mrs. Lois McCready is head of the committee on mechanical instruction.

Feminine Motor Notes

EIGHT of the eighteen members of a motor car class at the State Normal School, Santa Barbara, Cal., are women.

Mrs. B. M. Bower, Quincy, Cal., author of "Chip of the Flying U" and kindred books, drives an Overland Country Club model. She expects to make a transcontinental tour in her car this spring in search of material for a new book.

And Melba of the golden voice uses a Franklin.

Miss Mary B. McDowell is head of her own agency at Sharon, Pa. She does the majority of the battery work herself and is able to solve many knotty mechanical problems. Miss Italia E. Evans, Fort Wayne, Ind., had her choice of advising the public what library books to read and selling cars. She chose the latter.

Mrs. William Henry of Rome, Ga., is leading a movement to mark the Dixie highway through Floyd county. Mrs. Henry is chairman of the City Beautiful Committee of the Woman's Club at Rome.

Miss May W. Broke, who is agent for the Detroit electric at Norfolk, W. Va., says her work gives her a chance to express herself. Others also have found the work desirable, as witness Mrs. Helen T. Goodwin, Boston; Miss Italia E. Evans, Fort Wayne, Ind.; Miss Mary B. McDowell, Sharon, Pa.; and Miss Hope Loughborough, Little Rock, Ark., all of whom sell cars.

FRENCH WOMAN DEALER HERE

Mlle. Helene Dufrieu of Paris, the first woman to operate an aeroplane and the holder of many long distance records in aviation, was a recent visitor to the plant of the Chalmers Motor Co. in Detroit.

Mlle. Dufrieu sells the Chalmers in Paris and before she left Detroit ordered a large shipment of cars for immediate delivery to her headquarters in Paris. Mlle. Dufrieu has had the French sales rights for Chalmers cars for the last year and reports an excellent business in spite of the war.

Since the war Mlle. Dufrieu has been forced to give up active work in aviation. The French authorities do not permit the use of planes except for military purposes. When Paris was threatened by the German army the first time she reported for scout duty with her plane and was in active service for several weeks.

"At present the French government charges 70 per cent duty on American cars, and freight charges are so high that by the time the cars are set down in Paris they cost 100 per cent more than factory price," she says. "In spite of this fact I can sell all the Chalmers cars that I can get. Among my recent customers was Henri Farman, the biggest builder of aeroplanes in Europe. Mlle. Marthe Chenaille, the reigning actress and beauty of Paris, also drives a Chalmers."

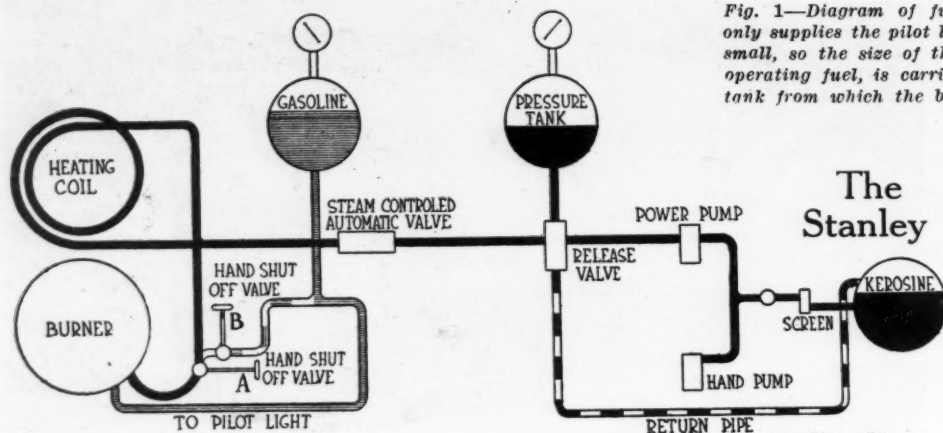
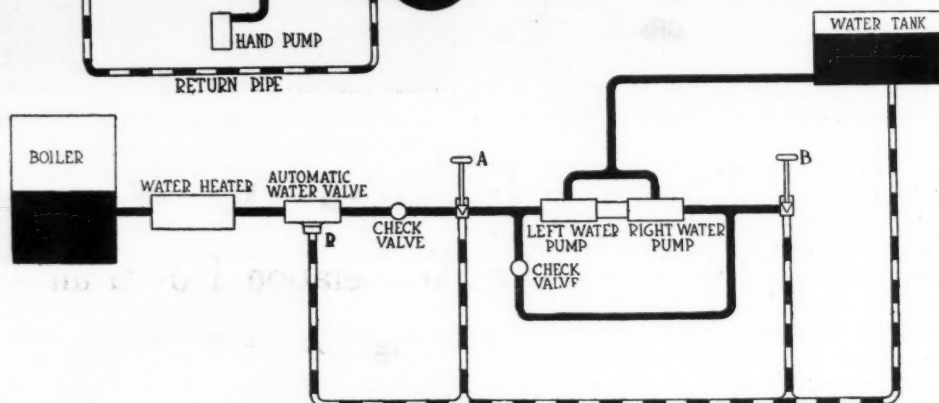


Fig. 1—Diagram of fuel system of Stanley steam car. The gasoline only supplies the pilot light, which never goes out, and the consumption is small, so the size of the tank is exaggerated in the cut. Kerosene, the operating fuel, is carried in the rear tank and pumped to the pressure tank from which the burner takes its supply. When the steam pressure reaches a predetermined point the supply of fuel is cut off and the kerosene pumped is allowed to go back to the main tank. The heavy black line in the cut indicates the kerosene supply, the broken black line the return lines for surplus, and the gray lining gasoline

Fig. 2—Diagram of water system of Stanley steam car. Water is pumped toward the boiler by one or two pumps, according to the positions of the hand valves A and B. After reaching a proper level in the boiler the release valve R is opened and the water then goes back to the main tank, whether the pumps are both working or not. In practice the left pump always is in use subject to the automatic control, and the right pump is hardly ever called into service



The Steam Car Today

HAD steam cars received the impetus of quantity production which has blessed the gasoline car business, the public in general would be more informed as to the really remarkable developments in this field. The gasoline car of 7 or 8 years ago was truly a crude contrivance, and because of its tremendous growth the public has become familiarized with the improvements and knows that it is a far superior proposition. Although it is a less known fact it is nevertheless true that the steam car has developed on an equal plane with the gasoline car.

Here is what one gets in the present-day steamers: Start and stop on the throttle; a pulling power at low speeds that most gasoline cars cannot approach; and it will accelerate at a degree possible only in big multiple-cylinder gasoline cars and probably will excel most of them; it will climb hills at a high rate of speed or at a crawl; it will turn over the rear wheels on concrete with the front of the car against a wall; it is quiet, practically vibrationless, free from carbon trouble, and far more economical in fuel than any gasoline car which will give the same performance. There are no gears to shift.

Another thing which seems to be contrary to general opinion. The steam car is not a complicated and delicate piece of mechanism, requiring constant watching and an everlasting amount of attention. That was the steamer of 5 years ago—it

(Continued on page 39)

The Doble

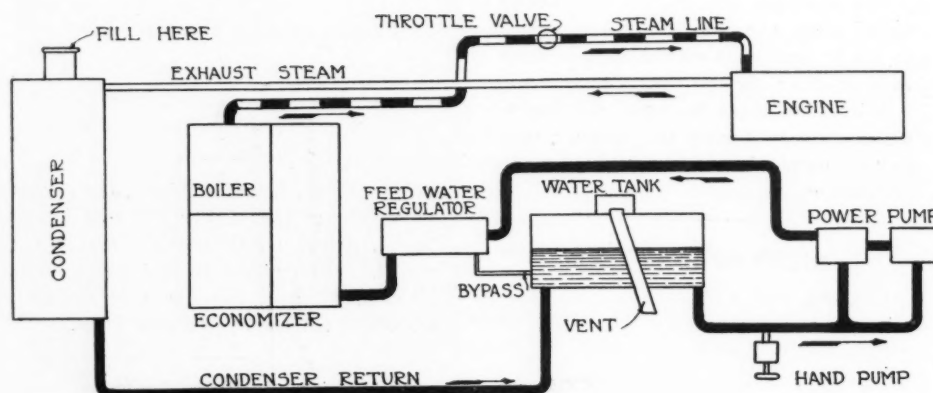


Fig. 3—Water and steam piping diagram of the Doble steam car. The cycle of operations is as follows: Water put into the condenser flows to the water tank by gravity. It is pumped by a power pump through the regulator and economizer into the boiler, where it is changed to steam. Steam from the boiler passes through the throttle into the engine, thence to the condenser, where it is reduced to water again

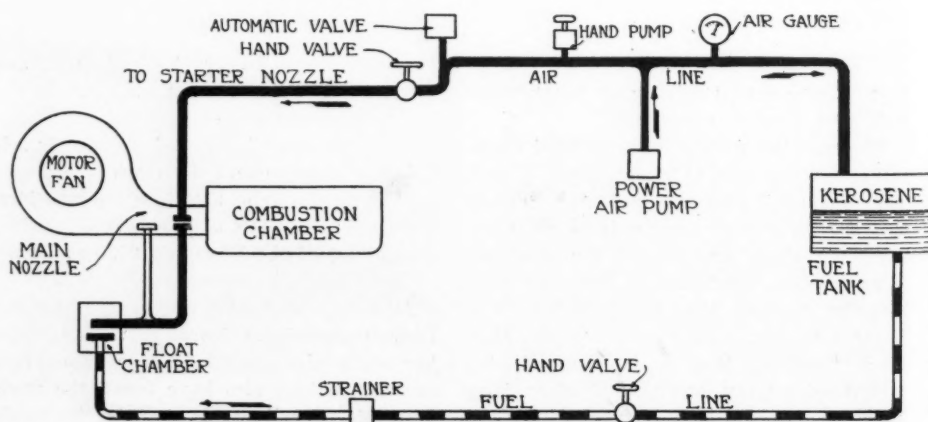
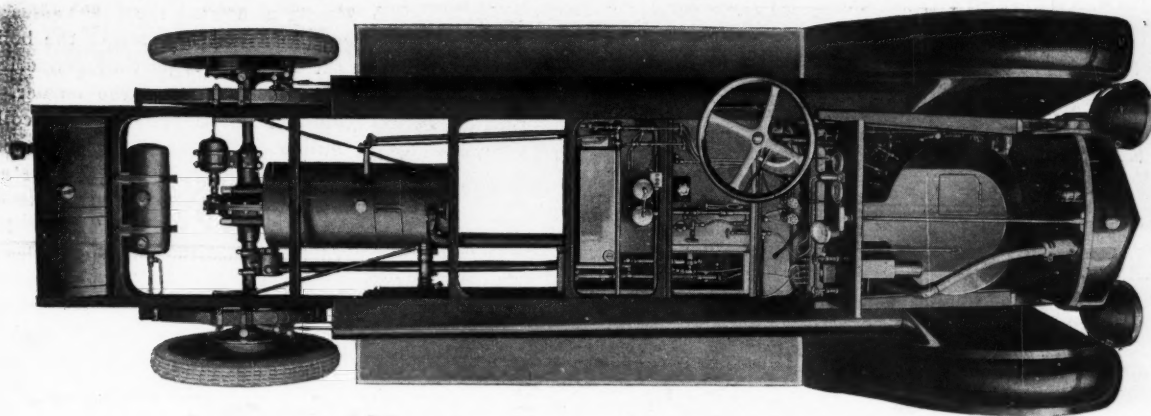


Fig. 4—Air and fuel piping: Air pressure of 2 lb. per square inch is maintained in the fuel tank. The blower motor is started through a switch, after which speed is regulated automatically by the steam pressure



Stanley Steamer Starts in a Minute

Flexibility, Acceleration, Power and Economy
Distinguish This Product

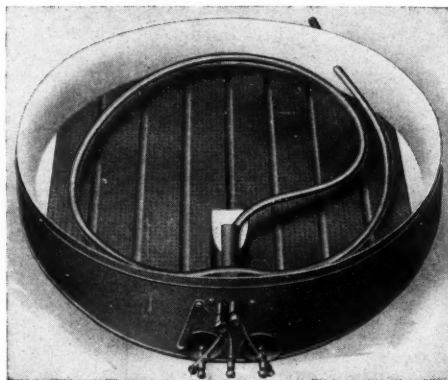
THE Stanley steamer operates as easily, in fact, very similarly to an electric car, is easier to handle in crowded traffic than any gasoline car built, has a pickup which drives your back into the upholstery and runs without an appreciable amount of noise and with no vibration. These things were proved to a representative of *MOTOR AGE* when he was permitted to drive one of the 1917 models through the streets of Chicago.

The drive was started in a car which had been standing in the garage for some 3 or 4 hrs. The pilot light was burning, consuming approximately 1/24 gal. an hour. It was a matter of stepping into the car, turning on the main burner with a small lever on the steering column, opening the throttle and steering into the street. There was no time lost in generating steam, no operation necessary other than turning the main burner lever. Throughout the drive the cloud of steam sent up by old model steamers was not in evidence; there were no disagreeable odor or roar from the main burner under the boiler.

Is Mechanically Simple

Mechanically this steam car is a simple proposition. There is an engine of the ordinary slide-valve sleeve type, which is built up as a unit with the rear axle. The crankshaft of the engine carries a spur gear which meshes with a slightly larger pinion on the differential. The engine is of two cylinder, double-acting type. This means that there is a power impulse with each up and down stroke. The valves which take care of the inlet and exhaust of the steam are operated from eccentrics on the crankshaft. There is a link motion conducted to a pedal located similarly to the clutch pedal on a gasoline car. This controls the range of the valve stroke, and its purpose is to give less steam through the ports and thus more econom-

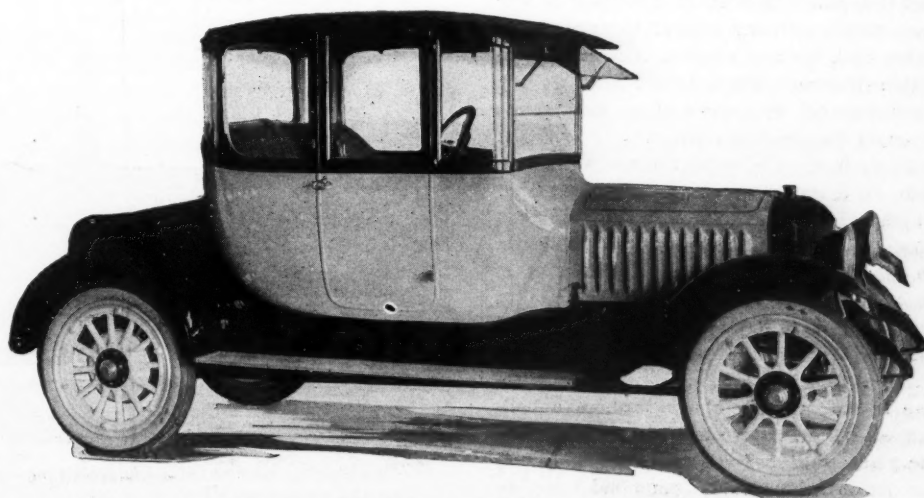
ical operation when the car is operating at normal speed on normal roads. The generator for starting and lighting is geared directly to the spur gear on the axle.



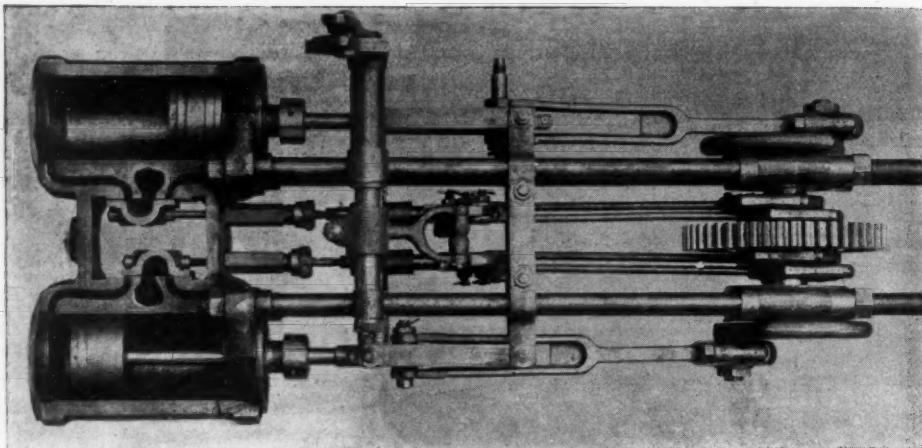
The Stanley burner. The pilot burner is in the center and the main burner intakes at each side. The coiled tube contains incoming kerosene and is a vaporizing medium

There are three passages admitting steam to the cylinders at boiler pressure for a large portion of the stroke. The valve is shut a certain distance before the stroke is completed, and the expansion of the steam within the cylinder drives the piston the rest of the way. Pressing this pedal forward until it catches hooks up the valves or shortens the length of time that steam is admitted to the cylinders under boiler pressure. This means that the piston is driven a longer distance by expansion. The same feature is embodied in a railroad locomotive.

When the steam has passed through the cylinders it is conducted to the condenser in front which is similar in construction to the radiator on a gasoline car. Here it is condensed into water and this water flows back into the main tank, thus heating the main tank water and creating another condition tending toward economy, inasmuch as less heat is required to convert this hot water into steam than as if it were cold. Thus the water is used over and over again. A tankful, 20 gal., will



The four passenger Stanley coupe with gray and black color scheme. The price is \$2,600



The Stanley engine with the cylinders cut away. The valve mechanism may be seen between the pistons and connecting rods

run the car 200 to 250 miles. There is a safety valve in the back of the top of the condenser which will open should the pressure reach such a point that it is liable to damage the tubes of the condenser.

The burner under the boiler is the power medium. When more power is needed more steam is needed and when there is a call for more steam the burners must bear the burden. Therefore it is essential that they be controlled automatically so that only enough fuel will be burned to take care of actual driving needs. The pressure maintained in the boiler approximates 600 lb. Between the pump which supplies the burner and the burner itself is an automatic fuel control valve. When pressure approximating 600 lb. is reached the steam pressure opens a spring within this regulator and seats a valve which cuts off the supply of fuel.

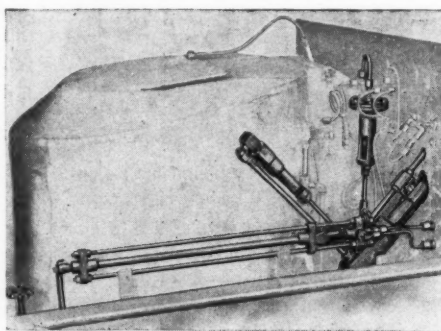
Pilot Light Burns Always

When the pressure again drops below the cut-off point the valve closes and the burners are once more ignited. It is the pilot light which serves the purpose of relighting the burners once they have been turned out by the automatic valve, and it is to be remembered that this small pilot is burning at all times. Thus, the main burners go on and off intermittently to take care of driving drain on the steam supply, and it is all done without attention on the part of the driver. Should the automatic valve fail, by any chance, there is a provision whereby the operator may do the work himself by means of an emergency lever on the steering column.

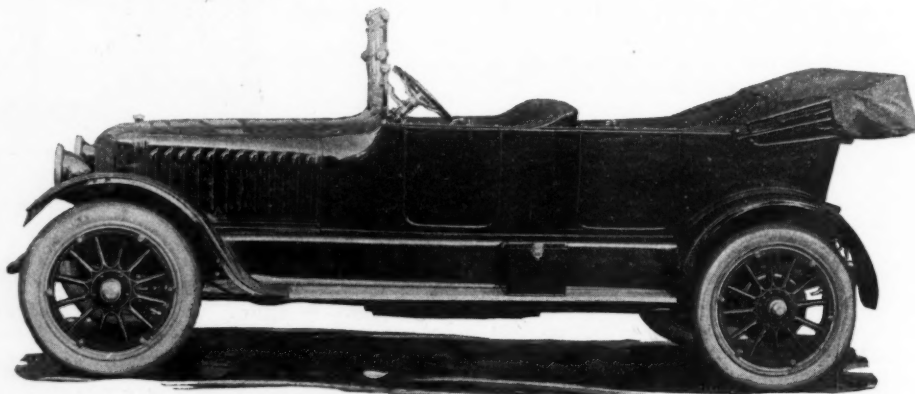
There is a set of pumps arranged in tandem, all driven by a reciprocating member which is in turn driven from the rear axle. This reciprocating member is inclosed in an oil-tight and dust-tight housing. One of these pumps furnishes air pressure to the gasoline tank which carries the fuel for the pilot light. A pressure of about 20 lb. is maintained, which feeds the gasoline in a form of a spray through a bell-shaped mixer. Here air is taken in and the pilot light beyond burns much like a gas jet in a house. It is a blue flame, as is the flame of the main burner.

The main-burner fuel is kerosene. This is carried in another tank. Another one of the pumps sucks kerosene from this tank and drives the fuel into a smaller tank which is air tight. This tank is thus partly full of kerosene and partly full of air, which is, of course, under pressure. The air is there to form a cushion against which the pump will operate. This insures a uniform flow and prevents fuel being sent to the burner in throbs imparted by the pump.

When the automatic fuel valve is open the kerosene from this tank proceeds under pressure to the burners. When the automatic is closed the fuel is by-passed back to the main tank. When steam is



The heavily outlined vertical member is the Stanley automatic cut-off which by-passes fuel back to the tank when a certain steam pressure is attained



The Stanley touring car. The outward appearance follows gasoline car practice even to the condenser which is practically the same in construction as a gasoline car radiator

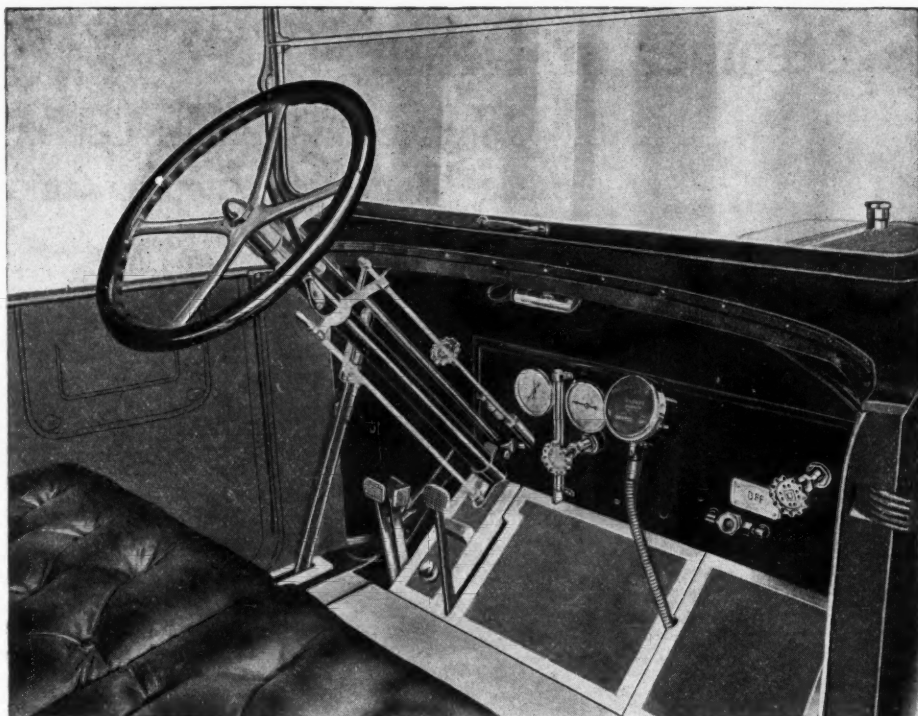
being generated the fuel passes through a coil which lies on top of the boiler. Here the kerosene is partially vaporized and it is then directed to the burner. There is another valve between this coil and the burner. This is the one connected with the emergency lever on the steering column which allows the driver to shut off or open the fuel line by hand. Before the fuel reaches the burning holes it passes over these burning holes, thus being effectively vaporized.

When firing up cold it is necessary to give sufficient pressure to the fuel by means of a hand pump.

Now suppose that one stops his car. He turns out the main burner by hand. The pilot is still burning and keeps things hot. When the driver wishes to start again, whether it be within an hour or a day, it is only necessary to turn on the main burner valve, the pilot will light the burner and the light load of steam which the pilot maintains will be raised quickly to an operating pressure.

If Pilot Gets Cold

Let us suppose that the pilot has been turned out and everything is cold. It is then necessary to light the pilot first. There is a Prest-O-Lite tank, motorcycle size, carried on the running board. This is piped to a gas burner which may be swung over the pilot nozzle. There is a door in the mudshield which, when opened, disclosed the nozzles. The Prest-O-Lite burner is lighted with a match and the flame is used to heat the pilot nozzle. This takes about 30 sec. Then the gasoline is turned on and the pilot light ignited with the torch. Then for another 30 sec. the torch is turned on the main burner nozzles and a valve is turned, admitting a small amount of gasoline from the pilot supply tank to the main burners, thus warming them up before the kerosene is turned on. This method, however, is seldom used, inasmuch as the pilot is carried lighted at all times when one drives day after day. However, it is not a difficult matter to start with everything cold. It can be done in 15 min. by one thoroughly familiar with the operations and 25 min. is enough time for a beginner.



Control arrangement of the Stanley. One pedal is a brake, the other is the hook-up pedal. The throttle is directly under the steering wheel

Water is also forced in under pressure, utilizing two more of the pumps. The old method of watching a gage to determine whether the water left in the boiler is too high or too low is all done away with in the new Stanley. This is now automatic. These pumps are driven off the same connection and suck continuously from the water tank and discharge toward the boiler. If the water is below a certain level it is pumped into the boiler, but when it rises to a certain level an automatic valve closes and allows a release valve to open, returning the water to the tanks. One of these pumps is an emergency device to furnish a large amount of water when an exceptional amount of power is demanded, and is not ordinarily functioning.

The boiler is the fire-tube type. It is in reality a big drum standing over the burners. The lower head and shell are one piece of pressed steel and the upper head is welded on, making the whole practically a solid unit. The shell is wound with three layers of piano wire as a positive resistance against any amount of pressure. This same principle is used in the construction of big guns for army and navy use. The central portion consists of a large number of tubes, of 1/2-in. size, welded vertically into the upper and lower headers. The heat from the burners passes through these tubes, and the space between them carries the water, regulated at a certain level, and the steam above it. The boiler is asbestos-covered to retain the heat.

Below the boiler and above the burner is a short coil of pipe which is connected to the throttle by a tube passing through the boiler. The steam passes through this on its way to the engine and the heat of

the burners removes all moisture from it. This process is known as superheating and its purpose is to give dry steam, which is more efficient than moist steam, to the cylinders. This steam, after passing through the superheater, makes a trip through another boiler tube and thus passes to the engine at a constant temperature.

When the steam passes out of the engine and before it goes to the condenser it passes through a barrel which is the feed water heater. This is both a refrigerator and a heater. It heats the water from the main tank before it passes to the boiler and it cools down the steam to some extent before it passes to the condenser.

Engine lubrication is automatic. The entire engine works in a bath of oil. There can be no harm done in bathing the pistons with lubricant, as there is no combustion and thus no release of free carbon. The oil consumption is very small. Lubricant is carried in a reserve tank and is forced to the engine by a very small plunger pump working in tandem with a water pump. This pump delivers through a sight feed on the dash, the feed amounting to about three drops a minute. Graphite is carried with the lubricant. Of course a spray of the lubricant is constantly carried off with the steam into the condenser and thence to the boiler. The graphite in this steam encrusts itself upon the boiler and entirely eliminates the old trouble of crusted tubes. It is no longer necessary to blow out a Stanley boiler to remove lime and scale.

The Steam Car Today

(Continued from page 36)

was also the gasoline car of 5 years ago—but not so to-day. The delicate automatic

contrivances have been eliminated. The complicated mechanism has been simplified so that it is an even less minute piece of mechanism than the gasoline chassis. What automatic features are still embodied are sturdy and require little attention.

One has two or three things to watch in a modern steam car. The burner jets must be kept clean, and the tanks filled. That is about all. There is no carbon to burn out. The condensing system of conserving the water supply has reduced the size of the tanks and increased the mileage per tankful. The old way of stopping at a farmhouse for water about every 50 or 75 miles is done away with. One need not bother about his tanks throughout a long trip.

Steam cars are capable of burning kerosene, and the drawback of finding a means of vaporizing the fuel is not evident as in gasoline cars. It heats itself with its own fire. Furthermore, one of these powerful cars, capable of climbing any grade upon which it can get traction and with a power performance not found in most of the largest gasoline engines will travel 12 miles on a gallon of this less expensive fuel.

Another impression should be corrected. The steam car is no more subject to the ravages of zero weather than the gasoline car. It will freeze up like anything containing water will freeze up, if one is negligent. But with a reasonable amount of attention, about as much effort as putting anti-freeze in the radiator, the steamer will not become frozen.

Starting a Steamer

The matter of starting after a night in the garage is another point upon which some possibly enlightening information can be given. One of the steamers carries a pilot light. The other ignites its fuel by electrical means. In the former the pilot may be left burning all night. It burns gasoline and will consume about 1 gal. in 24 hrs. Steam pressure approximating 50 lb. will exist in the boiler in the morning. With everything well heated from the pilot light, it is a matter of about a minute when the car may be driven out under its own power, and a matter of a very few minutes more when the main burners, ignited from the pilot light by the turning of a lever on the steering post, will have raised the steam pressure to the normal load up around 600 lb.

If the pilot light is extinguished and the mechanism becomes cold one must spend 20 min. and maybe more to build up enough steam to drive the car. Therefore, the function of the pilot light is to maintain a light pressure of steam and for the man that drives every day it should be left going continually.

In the other steamer, the boiler, being of a different type, permits gaining a head of steam more quickly than in the former. Furthermore, such a boiler will not maintain its head of steam as long as the one

(Concluded on page 41)

Doble Steamer in Detail

New Construction Permits Use of Kerosene Both for Starting and Running



The seven-passenger Doble steam car develops 75 hp., weighs 3500 lb. and has a 128-in. wheelbase

THE Doble steam car first described in the early summer of 1916 has received several further improvements, particularly in the combustion chamber. The new construction permits the use of kerosene both for starting and running. The burner is ignited by an electric spark, thus eliminating a pilot light. The claim is that this new system gives such complete combustion that no carbon is deposited on the generator tubing. Another claim is that sufficient steam for operating the car under its own power may be generated from cold water in less than a minute.

In the new burner fuel is fed by air pressure from a float chamber. A 3-lb. pressure is carried, feeding the gasoline from the float chamber, which is similar to that used in an ordinary gasoline carburetor, and from there to a spray nozzle which projects into a venturi tube leading to the combustion chamber. A small electrically-driven blower draws air through the venturi and past the spray nozzle with sufficient velocity to draw out the kerosene and atomize the mixture. The velocity decreases beyond the venturi opening and passes into a tapered widening tube and at this point the mixture is ignited by an electric spark. As soon as the burner is ignited the spark ceases automatically.

The combustion chamber is made of a special material which refracts the heat, thus obtaining a high temperature and insuring complete combustion by heating the gases before they burn. These hot gases pass into the generator sections and then up over a bridge wall and down again past the tubes of an economizer, where more heat units are taken out. Combustion may be stopped instantly by switching off the electric current from the blower. This switching off may be done by a hand switch or automatically by a radiator set to maintain a constant steam pressure.

The fact that many heat units are absorbed rapidly over the large heating sur-

faces of the generator tubing overcomes the disadvantage of slow firing up. No pre-heating of the burner is required.

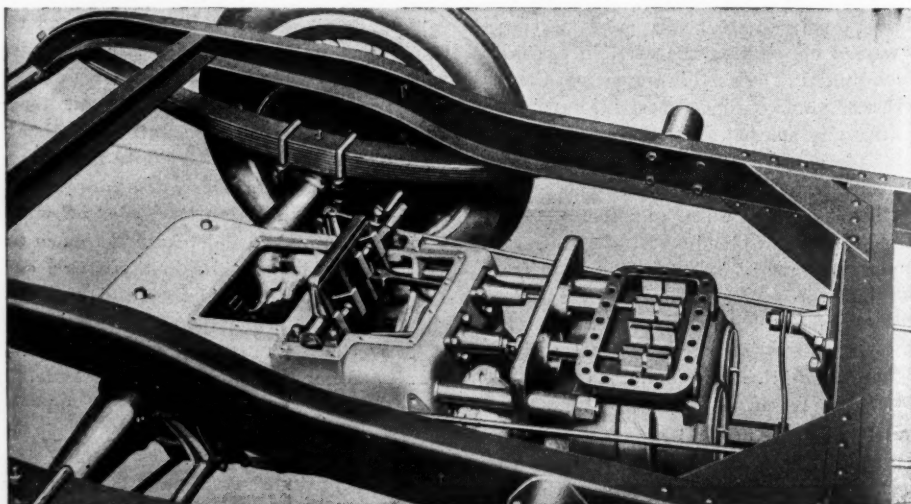
There are two parts of the Doble power unit; one is the steam generator and the other is the engine. The Doble boiler is a water-tube type with the water level carried in the evaporating zone. It consists of twenty-eight sections placed in an insulated casing. Each casing has two horizontal headers connected by sixteen vertical tubes made of cold drawn seamless-steel tubing. These tubes are welded to the headers at their swaged ends by acetylene welding, virtually making the section one piece of steel.

The Generator

Twenty of these sections are used for generating steam, and the remaining eight constitute the economizer. The combustion chamber is directly under the twenty sections, and the exhaust and the burned gases go below the economizer sections. These economizer sections are baffled partially from the remainder of the generator.

Thus part of the heat is consumed in the combustion chamber for the generation of steam, and many of the remaining heat units pass into the relatively cool water flowing to the economizer tubes.

Water first passes into the economizer tubes through their lower headers, being forced by a plunger pump. When these sections are once filled the water spills over from the upper headers into a manifold, which delivers it equally into all of the lower headers of the steam generating section. The water level is fixed in these sections about half way up the generator by a by-pass valve, which operates thermostatically, forcing the water from the pumps to lift the check valve and enter the generator when the regulator tube is filled with steam and consequently hot. As the water level rises the regular tube is filled with water from an exposed pipe. This water, which is cooled, causes the regulator tube to contract, thereby opening the by-pass valve and allowing the water to return to the supply tank.

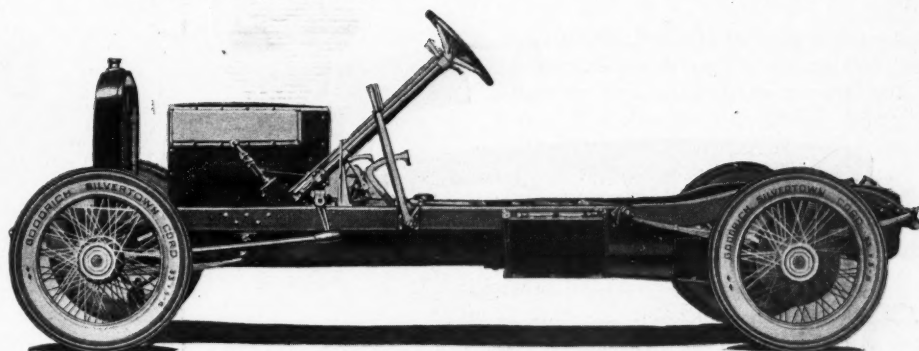


View of engine suspension, showing it with coverplates removed. It has two cylinders and is in unit with the rear axle

Normal steam pressure is 600 lb. This relatively high pressure permits rapid acceleration when the throttle is open. Each section of the generator is tested to withstand hydraulic pressure of 5000 lb., and the actual bursting point is said to be over 8000 lb.

Following the course of the live steam, it passes from the upper headers of the generator into a manifold, through the throttle valve and down to the steam chest of the engine. Once used, the exhaust steam is carried to the top of the radiator located in front as in gasoline cars and is forced down through it by the pressure of the steam back of it. A honey-comb type of radiator is used, giving an exceptionally large radiating surface. The steam is condensed here, and the water again is passed through the system.

There are eleven moving parts in the Doble engine. It is of the two-cylinder, single-expansion, double-action type. There is a quick-action valve and only one valve per cylinder, which takes care of the steam inlet while the exhaust passes out through ports uncovered by the piston at the end of its stroke. This is known as the uniflow principle, and with it it is possible to get a cut-off at 5 per cent of the stroke, if desired. The valve gear is a modified form of the Joy valve gear, eliminating, however, the correcting and anchor links employed in the latter.



Doble chassis—The steam generator occupies the same position as the engine in a gasoline car. The condenser is the radiator and the engine is on the rear axle

The cylinder has a 5-in. bore and a 4-in. stroke with a cut-off set at 1 in., used for all ordinary running. For starting or heavy pulling a cut-off of $\frac{5}{8}$ of the stroke is used. For high speed and economy $\frac{1}{8}$ is used.

Power to the rear axle is by two large spur gears with a 47-tooth gear on the engine crankshaft and a 49-tooth gear on the differential. The electric generator, which charges the storage battery and is used for lighting and ignition purposes for driving the air fan, is driven through an idler spur gear meshing with the main gear of the differential. All gears in the Doble power plant are constantly in mesh, thereby not being subjected to the wear of shifting gears.

The Steam Car Today

(Concluded from page 39)

which takes longer to generate it. It has its advantage in gaining a quick head of steam and its disadvantage in that it will not maintain this head to drive the car a mile or more to a garage should the fuel supply become exhausted. As previously stated the fuel is ignited by an electric arc, the boiler is very responsive, and steam is generated from a cold mechanism in about the time it would take to start a gasoline engine. In hot summer weather when it does not take long for the fuel to vaporize and start the engine in a gasoline car, it is undoubtedly true that the gasoline car can get out of the garage slightly sooner. In cold winter weather one could well afford to stake a bet on the steamer.

Lastly is its ease of operation. One has

four things to do in running a steamer. He starts the car with a hand throttle under the steering wheel, "hooks it up," or changes the stroke of the engine for more economical operation when the car has gained sufficient headway, steers the car and shuts the throttle and applies the foot brake when he wants to stop. There are no gears to shift. The engine starts the car from standstill in the same gears it uses at high speed.

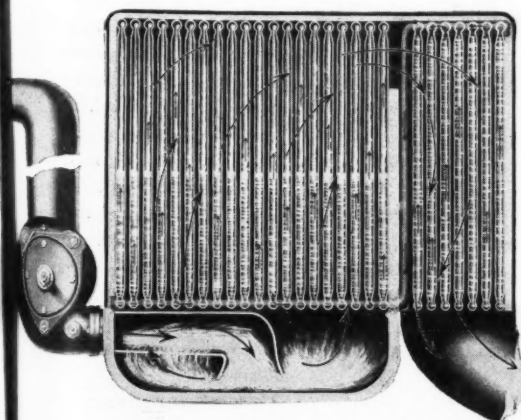
Thus, one can see that the steam car is a simple and efficient contrivance in its present stage of development. Its performance, in many ways, is unparalleled, and as far as longevity is concerned, there are a great many steamers of the more crude type built back in 1909 and 1910 that are still giving good service.

DENBY CHANGES PRICES

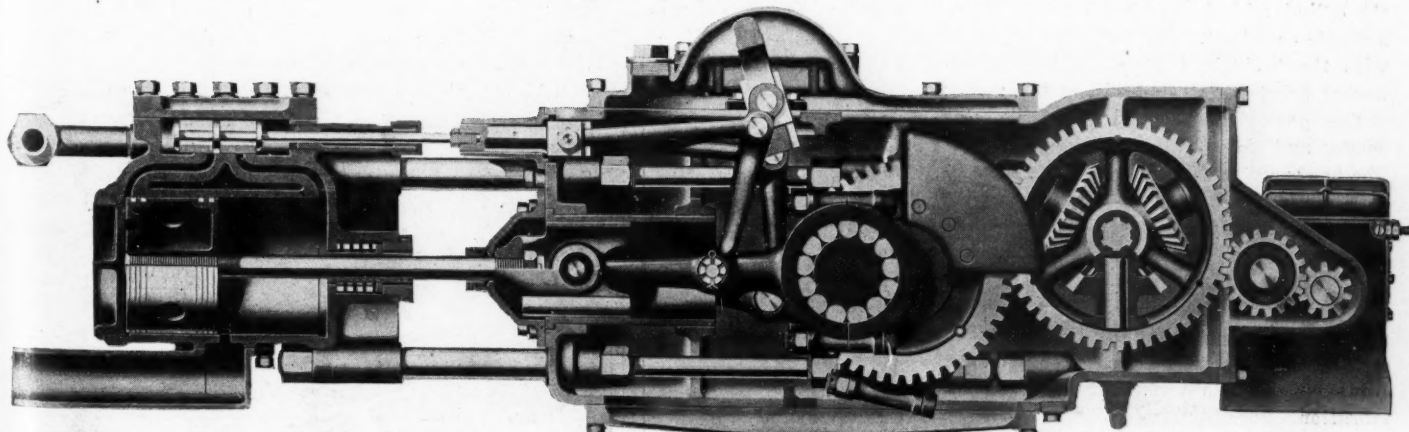
Detroit, March 16—The Denby Motor Truck Co. has changed the prices of its products. The 1-ton model R now sells for \$1,275; 1½-ton model G sells, chassis only, for \$1,775; 2½-ton model K, chassis only, sells for \$2,150.

TO MAKE DEY ELECTRIC

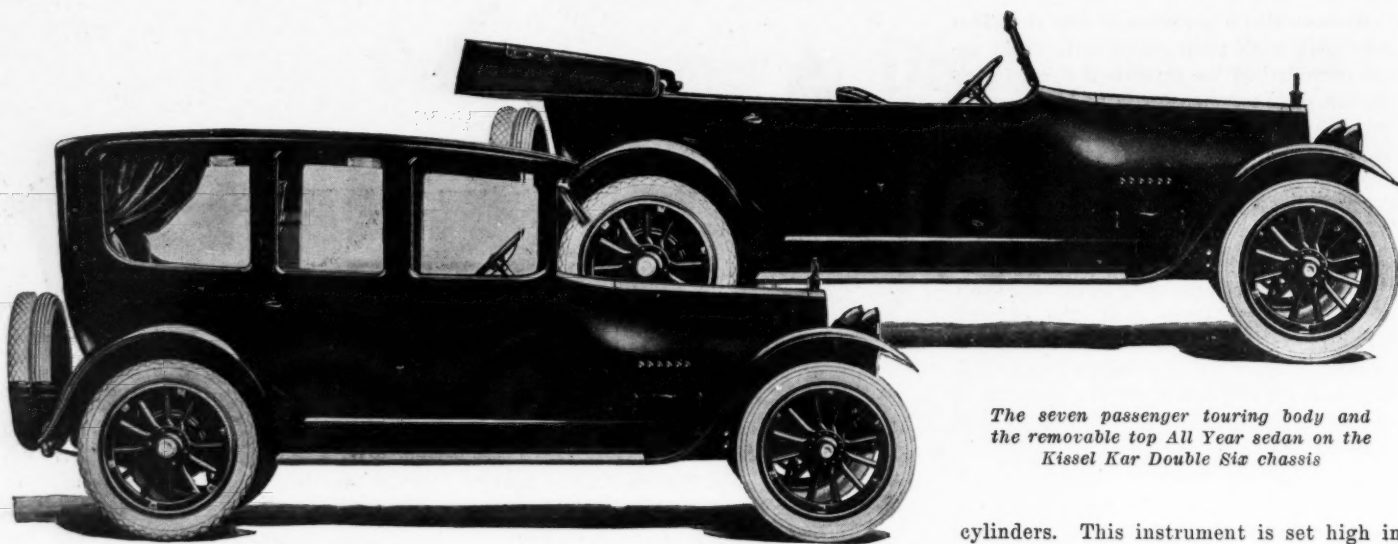
New York, March 16—J. W. Guthrie has joined H. W. Hayden and these two men are now busy organizing a factory at York, Pa., to manufacture the Dey electric. It will be remembered that this is the inexpensive electric with the patented axle and motor system invented by Doctor Steinmetz. It is planned to commence deliveries about June next.



Steam generator and combustion chambers. The large arrows indicate the direction of travel of hot gases; small arrows, of water flow. Water enters at right



Section through Doble steam engine and transmission, showing cylinder and piston at left, ball bearing connecting rod, spur gear drive from crankshaft to differential and gear driven pump in tank at rear



The seven passenger touring body and the removable top All Year sedan on the Kissel Kar Double Six chassis

Kissel Makes a Twelve

Weidely Powerplant in New Double Six

KISSEL has joined hands with the builders of twelve-cylinder cars. The newest offering of the Kissel Motor Car Co., Hartford, Wis., is officially titled the Double Six. First announcement of this car was made in the Feb. 1 issue of *MOTOR AGE*. The new model is now ready for delivery; in fact the factory is producing at this time five a day.

It is in the engine that the most radical departure in Kissel practice is found. The rest of the chassis is more or less founded on Kissel design as embodied in the sixes. It marks this manufacturer's adoption of the overhead valve engine. The engine is of course a twin type and it is built up of four blocks of three cylinders each with the V at an angle of 60 deg. The bore is $2\frac{7}{8}$ and the stroke 5 in. and with this rather unusually long stroke, brake horsepower tests have shown a performance of 82 hp., with the N. A. C. C. rating at but 39.7. This engine is Weidely built.

Weidely Twelve in Brief

The valves are completely housed inside the cylinder blocks and are operated from a single camshaft. For those not familiar with the Weidely twelve design, the following brief description will answer:

The gas intake header, water outlet header and the oil filler are cast integral. The heads are cast in blocks of six. Therefore each head fits over two cylinder blocks, inasmuch as there are two blocks of three cylinders each on each side of the V, as previously stated. The heads are removable. The crankshaft is a forging with three bearings of die-cast crankshaft metal. A running balance is given the crankshaft, which practically absorbs all vibration.

Because of the small bore and the compact design of the entire powerplant it is

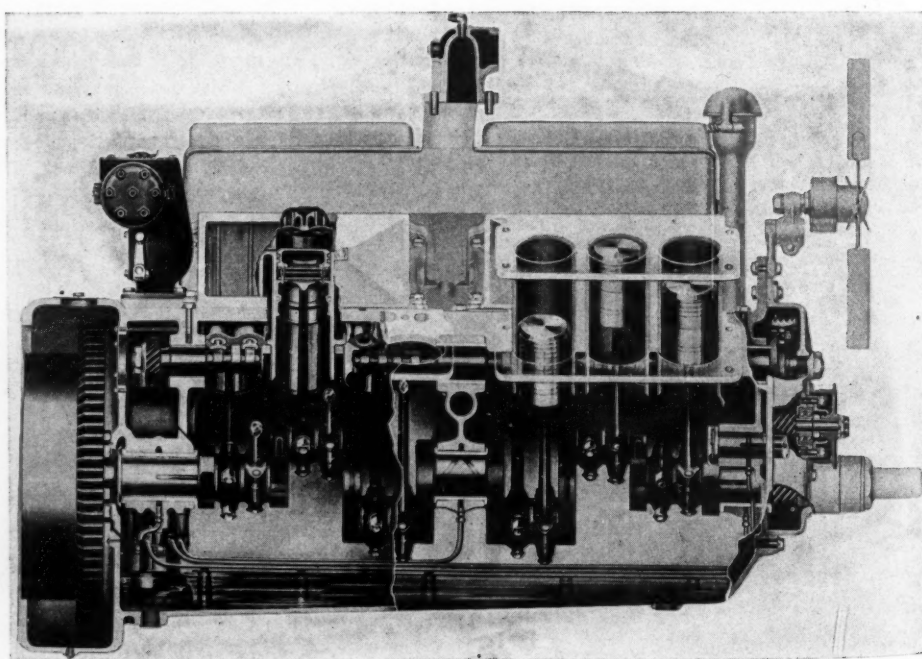
claimed that the crankcase is shorter than in any other twelve-cylinder engine. The lower section may be removed without disturbing other parts. The single camshaft is an alloy-steel drop forging and runs in phosphor bronze bushings. The pistons used are of semi-steel. Scientific distribution of metal makes these pistons of light weight. They are fitted with three non-leakable piston rings. Wrist pins are of steel tubing, $\frac{5}{8}$ in. in diameter. The engine is oiled by pressure from a positive gear type pump to the crankshaft and lower connecting rod bearings and by splash to other parts.

A Stromberg carbureter feeds gas to the

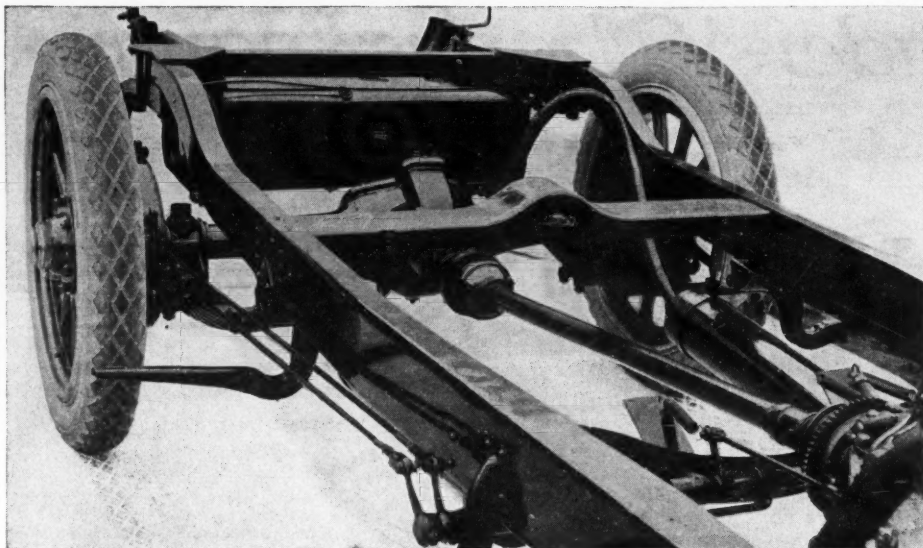
cylinders. This instrument is set high in the V between the cylinders. It is the new type of Stromberg which automatically provides a suitable mixture at all speeds. The fuel is drawn from a 16-gal. tank supported in steel brackets at the rear, by the Stewart vacuum feed tank.

A feature found in the twelve which was originally introduced in the Hundred Point six is the elimination of all but two grease cups in the entire chassis. Moving parts which formerly required grease cups are now lubricated by oil bolts. It is necessary only to squirt oil into the cups of these bolts at intervals.

Starting, lighting and ignition is handled by Delco units. The generator is driven by gear from the camshaft and the current output is controlled automatically by the Delco third-brush system. The starting motor engages the flywheel ring gear through Bendix drive. A Willard storage battery of the 6 volt, 108 amp. hr. type completes the equipment. In the arrangement of wiring is found another following of features introduced on pre-



Phantom view of Kissel Kar Double Six engine. The stroke is unusually long compared to the bore



As in other Kissel Kar models the frame of the Double Six is unusually solid. The rear axle is Kissel designed and made

vious Kissel models. All electric wires terminate at a central station on the front of the dash under the hood. This permits quick location of trouble and allows the complete removal of the body without cutting wires. The engine is ignited by the Delco distributor system with spark advance semi-automatic. Current to the distributor is of course supplied by the Willard battery.

Progressing from the engine to the rear axle, there is a dry multiple-disk clutch with asbestos-faced mats driving against hardened and ground steel plates. The gearset, which together with the clutch is in unit with the engine, is the selective type with three speeds forward and a reverse. The case is attached to the engine crankcase with a light bell housing.

The axles are Kissel built both front and rear. The front is an I-beam forging with chrome vanadium steel steering knuckles and arms. The rear is of the floating type, and in this the axle shafts are of chrome-vanadium steel. Spiral bevel gear and pinion carry the drive from the main shaft to the differential. There are two Timken bearings on the pinion shaft. The final drive is Hotchkiss with drive and torque taken through the rear springs.

Brakes Are External

Both service and emergency brakes are external. This will be recognized as another original Kissel feature. There are four contracting bands on the rear wheel drums, each having a 14-in. diameter with a 2-in. face.

The chassis is suspended on springs of chrome-vanadium steel. Semi-elliptics with a 2-in. width are used in the front and three-quarter elliptics with a 2¼-in. width in the rear. These rear springs are long and flat to minimize sideways and choppy road shocks.

The bodies are built in the Kissel shops and each one is built to withstand the strains that would be imposed upon it by the use of an all-year top, whether these

tops are furnished with the job or not. These bodies are built up with a selected ash frame over which is carried the paneling of silver finish pressed steel. There are twenty-two body finishing operations and all the bodies are interchangeable.

There is a corridor between the front seats. The standard bodies are upholstered in long grain hand-buffed leather over deep springs and genuine curled hair. Special material which will be furnished when specified is a mohair at \$50 extra or a tapestry mohair at \$100 extra. The bodies are painted Kissel blue with a hair-line stripe. Special jobs will be made up for \$25 extra with enameled hood and fenders and \$50 extra with specially painted hood and fenders.

The tires furnished as standard equipment are Goodyear cord, size 34 by 4½. Wood wheels are standard with an option of wire wheels at \$100 extra. The Double Six carries as standard equipment a Boyce

Moto-Meter, Stewart-Warner speedometer, Sparton motor-driven horn, ignition lock, ammeter and a complete complement of tools. The wheelbase is 128 in. The price with open bodies is \$2,250 and with an All-Year detachable top \$400 additional.

INSURANCE WITH EXTINGUISHER

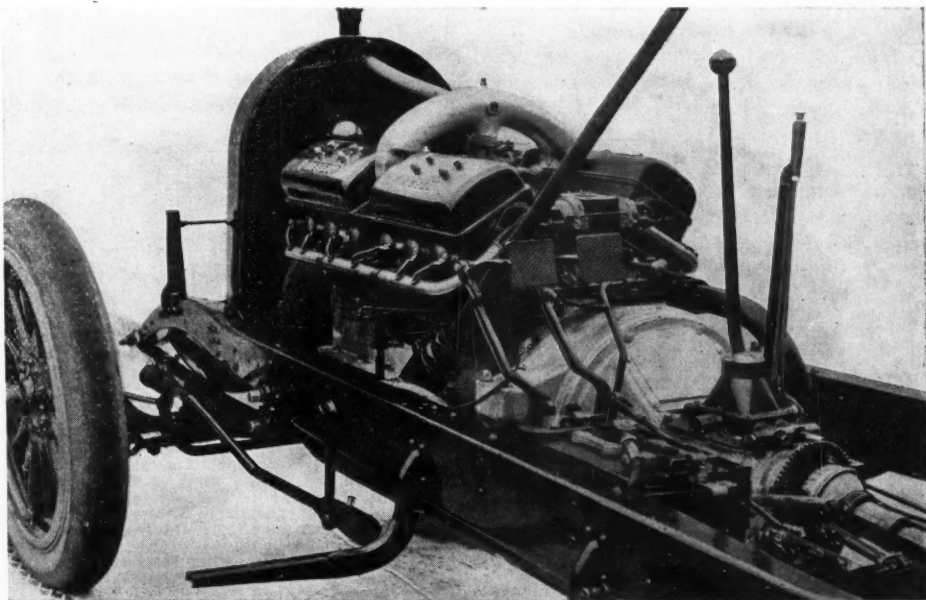
New York, March 17—Great is progress! One may not only insure his house, his factory and his motor car from loss of fire, but now he may insure his fire extinguisher from being stolen.

The Pyrene Mfg. Co. has entered into an agreement with the National Surety Co. to insure its fire extinguishers from being stolen from buildings, motor cars and so on. The Pyrene company attaches an application for insurance with a coin mailer and envelope addressed to the National Surety Co. on every extinguisher. All the buyer has to do is to place a quarter in the mailer, fill out the blank and mail the envelop.

The policy runs for 2½ or 3½ years, depending on the date issued. The extinguisher will be replaced on proof of loss to the surety company. As the Pyrene Mfg. Co. sold 350,000 extinguishers last year, the field of this insurance is by no means small.

FRANKLIN TESTS COOLING ABILITY

Syracuse, N. Y., March 16—Icy roads were no serious handicap to the 100-mile low-gear run in Iowa made when a Franklin touring car left Des Moines Feb. 16 on a trip to test the cooling ability of the air-cooled engine. Though the car slipped and skidded at times, it averaged 13½ m.p.h. on low gear without stopping the engine. Examination at the end of the trip showed no sign of overheating or other trouble.



Powerplant setting of the Kissel Kar Double Six. The motor is one of the shortest twelves made. Note layout of exhaust piping



The Readers' Clearing House



IN EXPLAINING TIRE PRESSURES Reader Doubts Difference in Pressure with Wheel On Jack

FOWLER, Ind.—Editor MOTOR AGE—Several weeks ago there was published in MOTOR AGE a statement that the tire pressure would register higher when the weight of the car was upon it than if it were not.

I wonder if the person answering this question ever tried the experiment of actually taking the tire pressure with the wheel on a jack, and again with the weight of the car resting upon it? The difference, if any, is too slight to be registered on an ordinary gauge.

I believe that the present method of rating engines by horsepower should be done away with. Horsepower terms are meaningless to the average driver, and as used now they are wonderfully inaccurate. I suggest instead that all engines be rated in cubic inches of cylinder capacity, which will afford an absolutely accurate comparison between different engines, which is the main thing.

2—Various tire manufacturers state that extreme cold is very hard on tires. Why is this?—Elwood S. Ingraham.

1—Quite true the variation is too small to register on the ordinary tire gage. Nevertheless the pressure within the tire is increased. Take for example a football filled with air. Kick that football with your toe. What happens? It sails through the air buoyantly. Take the bladder out of that football and fill it with some substance such as ground cork, which will give about the same weight as the bladder. Now kick it again and what happens? It does not sail through the air like it did with the air-filled bladder inside. Why is this? It is because, upon impact of your toe, the air within the bladder was compressed, then as the force of the impact ceased, the air expanded again and gave a rebounding action which sent the football so much farther than when it was filled with cork. Air within an inclosed space is always compressed when pressure is brought to bear upon it. When it is compressed it is naturally under higher pressure.

2—Rubber is more resilient when warm than when cold. Thus in extreme cold it is liable to crack. The other extreme, excessive heat, is even more hard on the rubber, however.

EXPERT FAILS, ASKS MOTOR AGE Cannot Diagnose Trouble from Meager Description

Ripley, O.—Editor MOTOR AGE—I have a 1914 Hudson 6-40, which has developed a loss of power on the hills and a miss when going more than 25 m.p.h. on level ground. No mechanic has been able to locate the trouble. The valves have been ground, new Perfection multiple piston rings put in, the ignition has been examined and found to be all right, and the timing was O.K., but the trouble was just as bad.

When this car came from the factory it had a Zenith carburetor on it. The casting of this broke, so I got a new Model H-2 Stromberg carburetor. This helped the trouble for a short time, but now it is worse than ever. Kindly state where the trouble is.

2—What is the gear ratio on high gear of a 1914 Hudson 6-40, and how many revolutions per minute will the motor develop?

3—How many revolutions per minute will a Ford engine develop?—V. D. Williams.

1—No mechanic has been able to locate the trouble and still you ask us to direct you to it from the meager description you

IN WRITING AN INQUIRY to the Readers' Clearing House Department

DESCRIBE THINGS COMPLETELY!

If your car is giving trouble, tell us all about the trouble and what you have done to try to remedy it. Always bear in mind that we are not looking at your car when we are reading your inquiry. Try to picture everything to us as we might see it if we were looking at your car. You understand it. Make us understand it.

Do not write in and say, "My engine has developed a serious knock. What is the trouble and how can I remedy it?" It is as impossible to give an intelligent answer to such a question as it is to answer the question, "Why is a mouse?" Tell us where the knock is, what it sounds like, what effect it has on the operation of the engine, under what driving condition it is most evident, etc. Let us have some tangible information to work on.

Do not ask us questions concerning motorcycles and motor boats. Our field does not cover these industries. Do not ask us for working drawings of engines, gearsets, etc. We endeavor to conduct an information department, but not an engineering department of such a nature. We cannot design the mechanical units of a car for you. This also applies to specifications for speedster bodies to be applied to touring or roadster equipped chassis. We will gladly give a general plan of a body, showing how it might appear when complete, but we cannot furnish complete patterns and working drawings for the construction of these bodies.

give. It is impossible, much as we regret to turn you down.

2—The standard gear ratio is 4 to 1. There is no official record of the maximum revolutions per minute.

3—About 1800, although there is no official record.

Cannot Give Body Patterns

Springfield, Mo.—Editor MOTOR AGE—I am building a speedster body to fit a model 80 Overland and I noticed your sketch in the last MOTOR AGE, but there were a few points I could not understand. If possible, I wish that you would make sketch to show all views of the body. I am sure it would help show how to make the best body.

2—In regard to lowering steering wheel, if lowered as far as shown in the sketch, would it touch the exhaust pipe?—Gail H. Story.

1—You will note in the boxed story on the first page of this department that it

is quite impossible for MOTOR AGE to give complete designs for bodies.

2—Provision would have to be made for suitable clearance over the exhaust pipe. Although the sketch was not drawn to scale, a similar body could be built with provisions for everything to clear.

SPEED FIGURES ARE IMPOSSIBLE Readers Ask for Data Which Cannot Be Given

Omak, Wash.—Editor MOTOR AGE—What is the maximum speed of the Overland Country Club roadster with standard gear ratio, windshield open, top down, and two passengers?

2—Would Lygnite aluminum alloy pistons increase the speed, and, if so, how much?

3—Is it advisable to use aluminum alloy pistons and connecting rods or merely pistons? What would MOTOR AGE advise?

4—Would cord tires increase the speed any, and if so how much?

5—Is the Radcliffe hydraulic transmission designed to be an accessory or a built-in feature? If an accessory, what is the approximate cost and method of installing on an Overland Country Club roadster.

6—What is the approximate maximum attainable equipped with the accessories mentioned in 1, 2, 4 and 5?—Bernard Parks.

1—There is no official record of the maximum speed of this car.

2—Probably if properly installed. One cannot possibly estimate the amount of speed increase.

3—Pistons are enough.

4—Possibly a small amount. No estimate is possible.

5—It is applicable to any car. We do not know the cost.

6—There is no means of estimating.

OIL LEAKS FROM HUPP GEARBOX Foreign Reader Wants to Know About Oxygen Carbon Removing

Melbourne.—Editor MOTOR AGE—In my 1916 Hupmobile there is a bad leakage of oil from the gearbox. I have had it attended to two or three times, but it still leaks. I used a mixture of grease and oil, then tried very thick special gear oil, but it leaks as bad as ever. What is the cause?

2—Is there any danger when going down a steep hill of switching off and when almost at the bottom to switch on again? In my first car, a Ford, I did this and blew the outside of the silencer off, so I have not tried it since.

3—Does kerosene mixed with petrol or benzine, in about one of kerosene to two of benzine, do any harm to the motor, or prove in any way detrimental, by causing carbon, and when cleaning the cylinders and pistons of carbon does the burning out by oxygen do the pistons any damage? I have been strongly advised not to have them done by that process.—T. H. Merson.

1—We are at a loss to understand just what this would mean or what is causing the leak, because there is nothing contained in the information you give us which would give an idea as to where the oil is leaking. Complaints of this nature are so few, according to the factory, that we could not by any means class it as a general trouble and give a remedy in that way. Therefore, we would advise that you write the factory, the Hupp Motor Car Corp., Detroit, Mich., giving its service department a thorough and complete explanation of the troubles you are encountering. If you are unable to do so yourself you should have

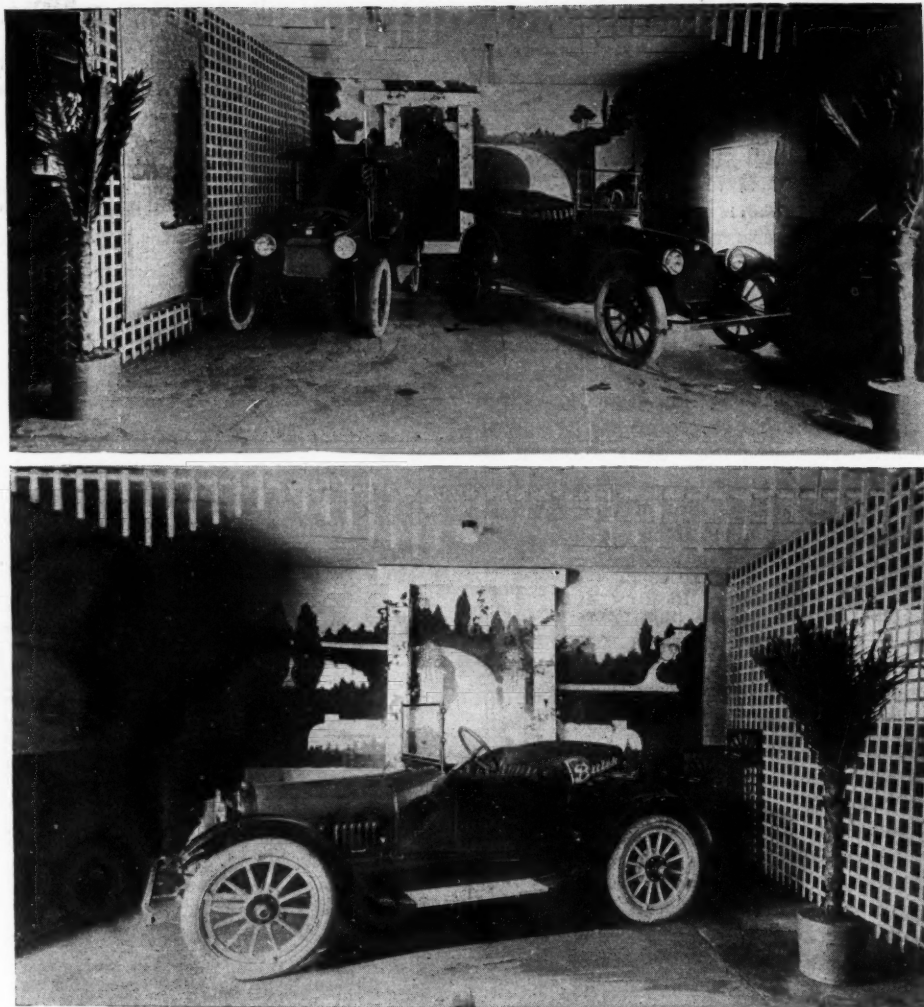


Fig. 1—An inexpensive salesroom built of oil paintings bought from a dry goods store, and lattice work

an experienced repairman diagnose the trouble for you and then you can present this trouble to the factory or to whoever sold you the car with suggestions for a remedy. If you communicate with the factory do not fail to give the car number.

2—There is always the danger of an explosion in the silencer. This is the only place harm can come.

3—Neither operation you mention is harmful.

WAYS OF INCREASING CAR SPEED No Particular Advantage in Planing Off Cylinder Head

Portland, Ore.—Editor MOTOR AGE—I have a 14 hp. car with a $2\frac{1}{8}$ in. bore. I would like to know two or three ways in which to increase the power and speed. I have one leak proof ring on each piston. Will planing down the cylinder head be of any advantage? If so, how much should be taken off?

2—What would cause the valves to open and close quicker?

3—Would this increase the power, and why?

—A Thomas.

1—Without stating the make of car you have us rather unprepared to give you any worthwhile information. General alterations for speed increase are: Magneto ignition, large racing-type carbureter, increased valve sizes, aluminum pistons, non-leaking rings, advanced spark, quicker valve action, reduced body weight and higher gearing. It would be of no worthy

advantage to plane down the cylinder head.

2—Tapering the cams for quicker rise and fall. It is a job for a man experienced in this work.

3—It would increase the power at very high engine speeds because it would minimize the lag of the incoming and outgoing gases. In other words it would minimize the effect of the egress and discharge of gases overlapping each other.

Inexpensive Salesroom

Arkansas City, Ark.—Editor MOTOR AGE—We hand you two photographs showing a very inexpensive way to make a salesroom,

Inquiries Received and Communications Answered

Elwood S. Ingraham.....	Fowler, Ind.
V. D. Williams.....	Ripley, Colo.
Gail H. Story.....	Springfield, Mo.
Bernard Parks.....	Omaha, Wash.
T. H. Merson.....	Melbourne
A. Thomas.....	Portland, Ore.
Collison Auto Co.....	Arkansas City, Ark.
George E. Peters.....	Springfield, Ohio
Harold Johnson.....	Corning, Ia.
O. L. Hock.....	Denver, Colo.
Lester Green.....	La Farge, Wis.
Jesse French.....	Bradner, Ohio
O. F. Helmscamp.....	Detroit
M. J. James.....	Groton, S. D.
Charles C. Miller.....	Griffin, Ind.
G. Huyke.....	Topeka, Kan.
D. W. Woolsey.....	La Harpe, Ill.
Edward J. Ellison.....	New York
A. Subscriber.....	Nolensson, Tenn.
Franklin Garage.....	Saskatoon, Sask.

see Fig. 1. The entire salesroom cost about \$75. The oil paintings were purchased from a drygoods store here, after this store got through using them in a display. The rest of it is lattice work painted with a flat white paint.—Collison Auto Co.

A CRITICISM OF FORD ARTICLE Does Not Like Williams' Idea of Lapping Cylinders

Springfield, Ohio.—Editor MOTOR AGE—I find much of value in Mr. E. B. Williams' "Making the Ford Car Fast," but desire to offer criticism on two or three points of his article.

I object most strenuously to his idea of lapping in either rings or pistons with any form of abrasive, carborundum particularly. The walls of the cylinders, being grey iron, are slightly porous. Some of the abrasive will, in spite of all care you may use in cleaning, remain in the pores of the metal, making a material and unnecessary source of wear to the engine.

A better way is to put the engine on a block, driving it from some external source of power, until lapped in. If this be not available, use no carborundum, if you must lap, but an abrasive with a pounded glass base. It loses its cutting ability sooner. Carborundum is our hardest and sharpest abrasive and is most valuable, in its place, for this reason. I think it much preferable to carefully run the engine in on its own power than to use any abrasive.

His remarks on putting spacers on the valve springs to stiffen them is poor advice. A spring is designed to operate under certain load and conditions. Any alterations tending to increase the load will seriously impair its efficiency and lead to inevitable trouble.

I think he has overrated the power necessary to drive a magneto, as he overrated the speed his engine attains. Approximately 1,800 r.p.m. is the best he has done under load. To use a source of ignition so subject to vibration, accidental shock, weather conditions, etc., as dry cells on a car of this character is foolish.

Last, but not least, he says: "It may be either a forging or of cast steel," regarding material for a new front axle. I presume Mr. Williams means a steel casting, because cast steel is obsolete as applied to tool steel. Do not you think he is taking much on himself in recommending a material, inferior in strength and resistance to crystallization to that which the factory deems requisite for safety?—George E. Peters.

Editor's Note—Spacers were used in the valve springs of Vail's Hudson racer and it surely made a creditable showing.

IGNITION LOCK NOT PRACTICAL Buy New Combined Ignition and Lighting Switch

Corning, Ia.—Editor MOTOR AGE—Would it be practical to put a switch between the battery and the regulator on a Dort car to lock the ignition and lighting?

2—I would put the switch on the front side of the instrument board. Kindly give a diagram showing the connections, and where should the ground wire be connected?

3—How much would it be practical to enlarge the Ford valves without weakening the block too much?—Harold Johnston.

1—It would not.

2—Buy one of the new combined ignition and lighting switches which has a lock on it and which the Dort Motor Car Co., Flint, Mich., is now furnishing to the trade as stock equipment, and put in place of the older one. No change in the wiring is necessary. A diagram of the Dort wiring with Westinghouse flange regulator will be shown next week.

3—An increase of $\frac{3}{8}$ in. in the diameter.

Flanders Carbureter Setting

Denver, Colo.—Editor MOTOR AGE—How does one adjust the carbureter on a 2-speed Flanders 20?—O. L. Hock.

While the engine is running with the throttle lever about one-fifth open, turn the auxiliary air-valve stem to the right not more than five turns. Proceed to turn

the valve stem slowly to the left or counter-clockwise until you have reached a point where the engine runs best. When a dense black smoke is emitted from the muffler it signifies that the mixture is too rich. The carburetor should be given more air as above described. Blue smoke signifies too much oil. Do not be confused with the two. When the engine misses as low speed the trouble is usually caused by too rich a mixture. The remedy is to give the carburetor more air. Should the engine make a coughing noise when the throttle is opened suddenly, it is caused by too lean a mixture, that is, too much air. The remedy is to reduce the air supply.

WANTS A MULTIPLE-SPEED FORD The Practicability of Such an Alteration Would Appear to Be Nil

La Farge, Wis.—Editor MOTOR AGE—I have been thinking of putting a unit transmission and rear axle in my Ford in place of the regular Ford axle, and had planned on a Studebaker or Overland axle. Kindly advise me as to the size.

The advantage derived of this is:

Let W = low
Let X = intermediate
Let Y = high
Let Z = reserve

I would have a WW low.....	1
I would have a WX combined.....	2
I would have a WY.....	3
I would have a WY combined.....	4
I would have an X.....	5
I would have an XY.....	6
I would have a Y.....	7

seven speeds forward beside reverse, or another combination on reverse.

What size axle would be required to stand up to the double low of the Ford and rear transmission combined?

What make of unit transmission and axle would fit the Ford universal housing, and also one of the same length of driveshaft?

Would like any additional information MOTOR AGE is able to furnish. I also would have a good, reliable emergency brake, which alone would be a freak on a Ford.—Lester Green.

1—We would consider this highly impractical. We see no reason whatever for such a diversity of speeds in a Ford car. In the most severe driving conditions it has been our experience that the Ford two-speed gearset is capable of taking care of every need. The expense of this alteration would be prohibitive. The fitting of a new axle would require special castings and a list of new parts, all special, which would be staggering were you to figure it all out.

AN OLD MODEL BUICK SPEEDSTER Would Not Pay to Spend Much Money On Job

Bradner, Ohio.—Editor MOTOR AGE—Is an old model 10 Buick good enough to convert into a speedster?

2—What would be the lowest approximate cost?

3—Would MOTOR AGE advise changing the gear ratio and the valve timing if the ratio and timing are the same as when the car left the factory?

4—What was the gear ratio of this model when it left the factory?

5—Can the steering gear on this model be lowered, and how?

6—Advise as near as possible the cost of reconstruction.—Jesse French.

1—Yes, if you do most of the work yourself. It is not worth spending a lot of money on.

2—Probably between \$25 and \$50.

3—There is no need of changing the timing. The gear ratio could be changed for more speed. New gears would probably cost you about \$25, however.

What Not to Ask

Editor's Note—In preparing answers for the Readers' Clearing House of this week's issue, the editor came across a surprising number of inquiries asking how fast certain models will go and how much faster they would go if certain alterations were made upon them. These questions are quite out of our grasp, in fact they can be answered by no one.

Where manufacturers have made official speed records under the sanction of the American Automobile Association, we will gladly print the speed figures made during that test. Where no tests have been made there is no source of positive information regarding these car speeds and we see no reason why we should guess at it.

Furthermore, the idea of anybody estimating within 5 or 10 m.p.h. how much faster a car will go with aluminum pistons, higher gearing, etc., etc., is absurd. A poor mechanic may install new parts intended to increase the speed and do such a sloppy job of it that the speed will, in reality, be reduced.

The same thing applies to the maximum revolutions per minute of an engine. Two engines of exactly the same model may have a difference in maximum speed of 200 r.p.m. Furthermore, when the engines become used, the maximum changes. It depends to such a great extent on the adjustment and general condition of the engine that no reasonably accurate figure can be given. Another thing we cannot give you with any accuracy. That is car weights.

4—MOTOR AGE has no record of the gear ratio of this old model.

5—The steering gear may be dropped down to any desired height and readjusted

so that there will be an equal amount of turning in either direction.

6—For a bucket seat skeleton body and incidentals about \$25. With new gears about \$50.

Speeding Up E. M. F.

Detroit, Mich.—Editor MOTOR AGE—What is the best time racers have obtained out of an E-M-F 30 racing car?

2—Kindly publish suggestions for converting a 1912 E-M-F into a racing car.

3—Would the increased efficiency gained by boring out and reseating larger exhaust valves be worth the expense and trouble?

4—What does MOTOR AGE think of counterbalancing the crankshaft on a four-cylinder motor?

5—What would be the best gear ratio on high for this model? I want to obtain the fastest mile I can get out of the car.—O. F. Helmkamp.

1—There are no late official records.

2—Suggested lines are illustrated in Fig. 3.

3—Yes, if the rest of the chassis is in good condition.

4—It will hardly pay in a car of this age.

5—It should be able to pull with 2½ to 1 gear ratio if cut down as indicated and the engine is tuned up.

Maxwell Speedster Body

Groton, S. D.—Editor MOTOR AGE—Kindly show by diagram how to rebuild a 1913 Maxwell Mascot touring car into a racer.—M. J. Jones.

Suggested lines are illustrated in Fig. 2.

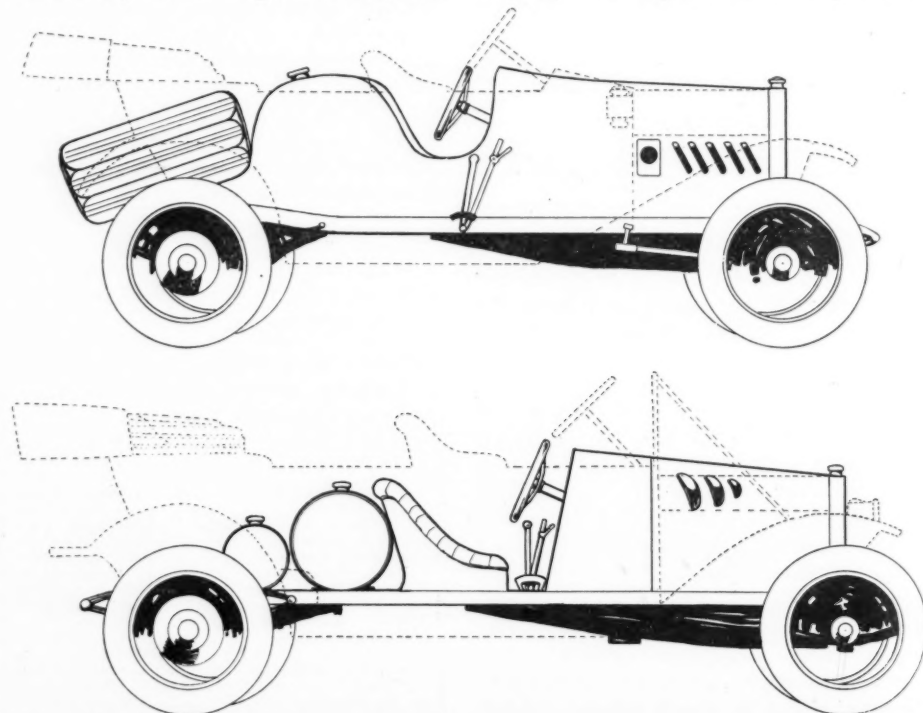
Magneto No Generator

Griffin, Ind.—Editor MOTOR AGE—I have a model 38 Overland equipped with a Remy low-tension magneto. Will the use of a transformer eliminate the use of dry cells for starting? Will this magneto furnish enough current for a small spotlight?

2—The present pinion gear has thirteen teeth. Will I noticeably increase the speed if I substitute a pinion with fifteen teeth, using the same differential gear and present wheels and tires?

3—What would be the result if I should cut 1 or 1½ in. from the lower end of the pistons. Would this cause the cylinder walls to wear excessively?—Charles C. Miller.

1—A transformer cannot be used successfully. A magneto is not a generator



Figs. 2 and 3—Maxwell 1913 Mascot converted into speedster. A 1912 E.M.F. cut down at small cost

and will not furnish current for a spotlight.

2—The speed would be increased somewhat. You must be sure that the larger pinion is of the correct pitch to fit into the ring gear.

3—It would undoubtedly cause the piston to slap, that is the bearing surface would be so reduced that the piston would tend to wobble in its course up and down the cylinder.

BODY FOR CONVERTING CADILLAC Cantilever Springs Could Be Used to Reduce Height

Topeka, Kans.—Editor MOTOR AGE—Give an illustration of a body to be used in converting a 1915, eight-cylinder Cadillac into a racer. I want everything to be as low as possible and the fenders removed.

2—Explain how the steering wheel and frame may be lowered, and, if possible, how may the lift of the valves be increased? I want the cowl to extend back on a straight line with the hood, to the steering wheel. I wish to have a gasoline tank back of the low seat, and the extra tires placed back of the tank.

3—What would be the approximate speed of this car under favorable conditions, and what would be the cost of building the body? I do not want the car for racing, but want a fast car for driving around town and in the country.

4—How would a lower gear ratio do on the rear axle of this car?

5—Kindly suggest some improvements that would tend to increase the speed.

6—Could the two speed rear axle be fitted to this car, which was used on the 1914 Cadillac? If so, would this be advisable?

7—If the car can go 58 m.p.h. now, what would be the speed when rebuilt?

8—Give an illustration of a rebuilt Simplex car.

9—What speed is the Simplex guaranteed to make, and what would be the speed with a racing body?—G. Huycke.

This is shown in Fig. 4. In order to reduce the over-all height of the car cantilever springs have been fitted in the rear. This respringing of the entire car would be a costly alteration but goes to show what might be done were one willing to spend that much money.

2—The steering wheel may be lowered by dropping it down to the desired height and resetting the split sectors about the worm so that the steering wheel would turn the front wheels an equal amount in each direction. It would require a new camshaft to increase the lift of the valves.

3—There is no means of estimating the speed. You might get the body built for \$500.

4—There is really no need of a low gear ratio. The car has all the speed you can use and you would rob it of a great deal of its flexibility were you to lower the ratio.

5—It is our opinion that you would waste money trying to increase the speed. This engine is designed throughout for its present maximum speed. Why increase it and impose a tax on the parts?

6—It would not be advisable.

7—With a lighter body you could expect some increase. However, there is no way of giving you even an approximate estimate, inasmuch as there are so many factors which enter into it.

8—You would be obliged to inform us of the model.

9—Simplex does not guarantee a speed to our knowledge.

Schools for Acetylene Welding

Editor's Note—In the issue of Feb. 1 there was an inquiry concerning an oxy-acetylene welding school. MOTOR AGE replied to the inquirer that there was no school in which welding by this process was taught, which was an erroneous statement. A thorough course in this operation is given by the Michigan State Auto

School, Detroit; the Howard Auto Laboratories Co., Des Moines, Iowa, and the Sweeney Automobile School, Kansas City, Mo.

It might be interesting to know that there are fifteen instructors in the Michigan State Auto School who are members of the Society of Automotive Engineers. Faculty meetings are held weekly and new developments in motor car engineering are discussed, with the view of having every department of the school thoroughly up to date at all times.

Converting Old Haynes

New York—Editor MOTOR AGE—I have had in mind converting my model 19 Haynes five-passenger. Would you publish a drawing as you have done for others?

2—Do you think the radiator now in use will look well or would you replace it so as to get the proper lines?

3—The weight is about 2,400 lbs. Do you think after taking off weight it will permit using lighter front springs?—Edward J. Ellison.

1—Illustrated in Fig. 5.

2—A different shape would give a racier appearance.

3—Very little of the weight reduction is at the front end. You will not be able to use springs very much lighter than those at present employed.

No Maximum R.P.M. Record

La Harpe, Ill.—Editor MOTOR AGE—What is the fastest speed r.p.m. ever obtained by a gasoline motor car engine?

2—Where are the Leavitt aluminum pistons manufactured?

3—Where can I obtain an Isotta Fraschini catalog?

4—What is the price of the Packard aviation motor used in the Packard racing cars?—D. W. Woolsey.

1—There is no official record of a high-speed engine speed.

2—Walter M. Leavitt Co., New York City.

3—Isotta Fraschini Motors Co., 1920 Broadway, New York.

4—No price has been fixed for public presentation. You might write the Packard Motor Car Co., Detroit, for this information.

Wants More Light for Saxon

Nolensville, Tenn.—Editor MOTOR AGE—In the Saxon six 16, model A 15 c.p. ordinary bulb is used in the headlights. I would like to get a little more light from my lamps and would like to know what c.p. nitro bulbs to purchase. This car uses a 6-volt Exide battery.

2—Would it be advisable to replace the tell-tale of this car with a dash ammeter? If so, explain how to connect.—A subscriber.

1—We would suggest a 24 c.p. nitrogen lamp.

2—The tell-tale serves the purpose of an ammeter. There is really no need of changing. If you desired to use an ammeter, however, you could attach it directly in the place of the tell-tale.

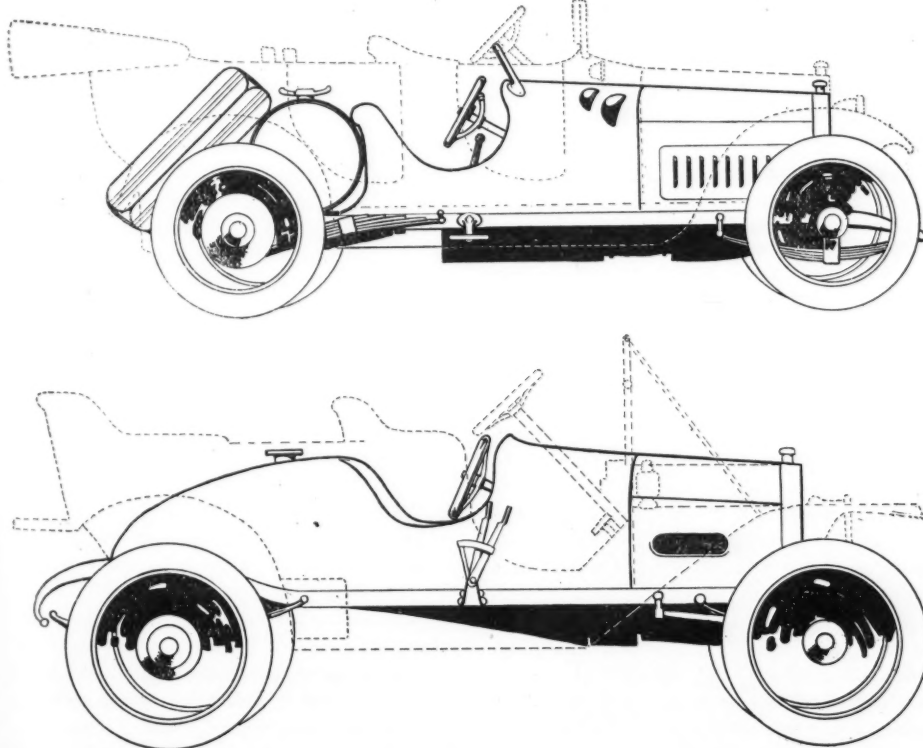
Setting Ford Bearings

Saskatoon, Sask.—Editor MOTOR AGE—In overhauling Ford motors is it advisable to set all the bearings so as to start the motor by hand or by towing?

2—Give the names and address of manufacturers of ball bearing thrust washers for Ford cars.—Franklin Garage.

1—These should be so set that the engine can be started by hand.

2—Where do you intend to use these thrust washers?



Figs 4 and 5—Speedster body for 1915 Cadillac eight with cantilever springs to reduce overall height. Model 19 Haynes cut down with racer body



The Motor Car Repair Shop



Hints from Readers

Finding Polarity of Wires Chemical Method Which May Be Used in Storage Batteries

EAST ORANGE, N. J.—Editor MOTOR AGE—A simple method of determining the polarity of wires is as follows:

Take a piece of blotting paper, place a few grains of iodide of potassium on it and wet the paper and the salt will quickly dissolve. The iodide may be purchased at any drug store. Then touch the wet paper with the two wires and the positive wire will produce instantly a black stain on the paper.

If the two wires are introduced into a bottle containing such a solution, there will be a steady stream of dark red given off from the positive wire, this being metallic iodine reduced by the electric current.—James H. Webb.

Recharging Ford Magneto Method Does Not Require Gearing Down Car

Greensburg, Ohio—Editor MOTOR AGE—The Ford magneto may be charged in the car. Six fully charged 6-volt, 60-amp. storage batteries, a compass and some wire are required for doing the job. The storage batteries are connected in series and the negative wire is grounded on the car. The positive wire should have a rod attached to its end and then the magneto plug should be removed and the rod thrust in to make contact with the magneto inside the cover. Place the compass a small distance behind and at the left of the hole for the magneto plug and have some one turn the engine over until the needle points to the front of the car. Then open and close the circuit by removing the negative wire from the car. The circuit should be held closed for 6 sec. at a time and then broken, this operation being done twenty-five times.—Maurice Prentice.

Gasoline Cleans Magneto Things to Look Out for in Using Dangerous Fuel

SALT LAKE CITY, Utah—Editor MOTOR AGE—Due to its rapid evaporation gasoline is selected frequently to wash the magneto free of external dirt or dust. Quite frequently, too, the contact breaker and the region thereabouts are given a good dousing. The need of caution is because gasoline of to-day does not evaporate as readily as it did when refiners supplied a higher test fuel, and in consequence the

More Ideas

Motor Age readers are coming through, slowly, with some good repair shop ideas. Do not be reluctant to send your ideas to us. If they help you they will surely help somebody else, no matter how crude they may seem in your own mind. The simplest way of doing a thing is always the best, and if you can do it with a crowbar then why use an arbor press?

It takes all we have got this week to fill up this one page. Wake up men! Send enough through so we can have some ahead at all times. There is no reason why this department should not take up two pages, and it is up to you to help us out. Look at it this way. Suppose you send one valuable suggestion that is printed in Motor Age. There will be anywhere from three to a dozen more printed the same issue, and some of them are going to help you out. That is fair exchange, is it not?

If you read the articles on this page and find yourself benefited by them, stop and think of something you are doing which you have not seen done before. You may even have a new way of washing a car. Some clean method of filling grease cups. Such things are not trivials. They are a great help to the man who is doing it in a more difficult way.

surface of the washed magneto retains a film of gasoline longer than at first suspected. Should the engine be turned over directly after cleaning the magneto, a spark from the contact breaker would set fire to the film of gasoline which covers the magneto and what would result is hard to say—maybe little, maybe much.

If the wires to the spark plugs have been removed, here is an additional possibility of a fire, for gasoline may be forced into the chamber of the external spark gap, and should any contact cause the magneto's armature to be rotated, a spark would pass across the spark gap and light the liquid.

There is no danger of any of this occurring if the magneto is wiped dry, gasoline used sparingly and the magneto or car not put into immediate operation. Just common horse sense saves a lot of trouble.

Another point; should the magneto be taken apart completely it is not entirely wise to wipe all parts in gasoline and then

assemble. It would be preferable to wash all parts thoroughly in gasoline and then in clean kerosene oil, for when steel parts are washed in gasoline they become absolutely dry as soon as the gasoline evaporates, which causes these parts to become more susceptible to rust. Ball bearings in particular are parts which suffer from this treatment. When they are replaced they should be given a thorough covering of light oil, not soaked in it. This not only lubricates but protects against rust.

The armature can be washed in gasoline, but it is not good practice to permit it to soak, as the armature covering may be softened and a possibility exists of damaging the condensers also.—John Boardman.

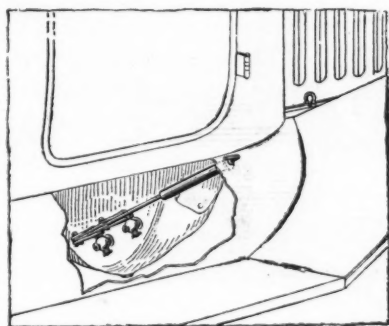
For Honeycomb Radiators What to Do If Defective Cells Spring a Leak

Kansas City, Mo.—Editor MOTOR AGE—It sometimes happens that, owing to a fault in the process of manufacture or an accident, one or two of the cells or tubes of a cellular or honeycomb radiator may spring a leak. In such cases a quick and effective repair may be made by plugging up the ends of the cells or tubes themselves with soft lead or a piece of wood whittled or cut so as to fit snugly into the ends of the cells. When plugs are used they should be driven in from the front and back of the radiator and then cut off and carefully hammered flush with the surface; or if convenient have a tinsmith solder around the edges of the lead plugs. Unless an expert, one should not attempt to solder a radiator, for one is very apt to open a few of the surrounding cells and cause more harm than good.

Radiator leaks are hard to find, usually. They may be detected often by steam issuing from them, but if this is not the case, and the exact spot from which the water is escaping cannot be determined readily, the best thing to do is to remove the radiator. Plug up all the openings, such as inlet and outlet, except one, with cork or wooden plugs. Then, into the opening which still remain open place a plug through which the plug of a tire pump passes. Place the radiator in a tub of water and pump air into it by means of the tire pump. Bubbles will issue from the leak or leaks, which should be marked immediately with chalk so as to be located easily later when the repair is to be made. Of course it is quite imperative that the plugs seal the radiator very nearly air tight.—Bernard Foster.



The Accessory Corner



Showing location and method of attachment of the Chester Smith Co. oil gage for Fords

Utility Universal Wrench

THE utility wrench sets are composed of three wrenches and two handles, put up in a cloth bag. They are claimed to have all the advantages of sets containing sixteen socket wrenches. Each wrench consists of a barrel with a tapered interior on one end. Into this taper fits jaws with Vs cut in the inner surfaces. These jaws are connected to a pin which passes through the center of the barrel and protrudes through each side of the barrel in slots. By moving the pin forward in the slot the jaws come out of the taper of the barrel and open up in degrees proportionate to the taper. Thus one opens the jaws of the wrench until the Vs fit over the nut to be worked on, then the barrel is pushed down and the Vs are a close fit over the nut. A handle is inserted through two holes at the other end of the barrel and the nut is removed or tightened. It will handle hexagon nuts from $\frac{1}{8}$ in. to $\frac{3}{8}$ in. and square nuts from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. The price complete is \$2.50. Another combination is the universal wrench set with a detachable brace. This brace can be attached instantly to any of the three socket wrenches. The price complete is \$3.50. The Hill Pump Valve Co., Chicago.

Oil Gage for Ford Engines

A new and unique device to determine the oil level in Ford crankcases without either reaching or getting under the car is marketed by Chester Smith Co., Monmouth, Ill. A slight pull on the handle coming through the mud shield opens the pet cocks. Upon releasing the handle a spring closes and locks the pet cocks, preventing any possibility of oil leakage. This gage has been tested out on over sixty cars for the last nine months. It consists of a lever connected through joints to the two pet cocks. The lever extends through the mudshield, and between the mudshield and the pet cocks it passes through a barrel which contains a spring. It is the purpose of this spring to keep the pet cocks closed



The Moto-Fan, a device for removing hot air and inserting fresh air into the radiator

at all times and to close the cocks by spring pressure after one has pulled the lever to open them. The gage will retail at \$2.

Moto-Fan Radiator Cooler

The Moto-Fan is an instrument designed for attachment to the radiator cap. It consists of a rim within which is a four-blade fan. This fan is operated by the pressure of the wind when the car is being driven. The shaft which screws into the radiator cap is hollow and this hole is connected with two passages within the rim surrounding the fan, these passages having outlets horizontally opposed to the axle of the fan. When the fan is revolving it creates a suction in one outlet and a blowing into the other. It is the purpose of the instrument to draw heat out of the radiator at one of the ports and drive cool air into the radiator



Utility universal wrench set to handle hexagon and square nuts of all common sizes

tor through the other, thus maintaining a cool temperature within the radiator. The price is \$2.50. The Art Metal Works, Newark, N. J.

Truck Demountable Cushion Pad

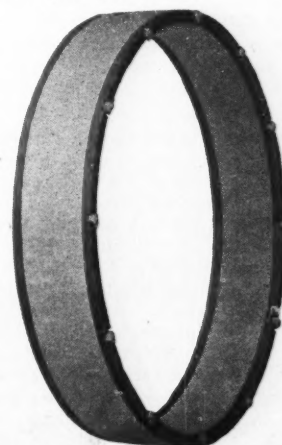
The Miller demountable cushion pad for truck tires consists of a single strip of rubber $\frac{3}{8}$ in. thick and as wide as the rim it is to fit, with steel flanges on both edges. It fits between the steel tire base and the steel S. A. E. felloe band. No alteration is required for its installation, though tires used with it must be 2 in. greater in diameter, owing to the thickness of the pad. With the pad to remove a tire it is only necessary to loosen the nuts and lift the tire off. It lessens the labor of applying and removing truck tires and requires only a socket wrench in the way of tools. Besides cutting the repair bill it increases tire mileage. Miller Rubber Co., Akron, Ohio.

Aluminum Welding Compound

A new invention called So-Luminum is claimed to mend defects in sheet or cast aluminum with the use of a gasoline torch to subject the parts to boiling water or steam. The compound also joins aluminum to copper and brass. It is designed to take the place of oxy-acetylene welding. The So-Luminum Mfg. & Eng. Co., New York.

Community Flag Holder

A timely accessory which fits in with the nation-wide sentiment towards patriotism is the patented Community flag holder which is designed to fit on the radiator caps of motor cars. This flag holder is made of solid brass and covered with triple-plated nickel. The holders are made to order for each individual town. The name of the town and state is moulded into the holder. Thus, it is a means of boosting one's own town and demonstrating patriotism at the same time. The same device is useful for carrying pennants if one desires. It is manufactured by the A. F. H. Co., Dayton, Ohio.



The Miller demountable cushion pad for truck tires



Among the Makers and Dealers



TRACTOR AND TRUCK CO-OPERATE IN DEMONSTRATIONS—The Los Angeles representative of the Signal truck and Avery tractor demonstrates in a distinctive way. He loads a tractor on the truck and drives into the rural districts, runs the tractor off the truck on its own power and goes to work with it cultivating the fields. When the demonstration is completed the tractor is driven on the truck again and taken back to his place of business. As the truck passes along the roads it shows its carrying ability.

TO Direct Scripps-Booth Advertising—S. W. Foran has been made the advertising manager of the Scripps-Booth Corp.

Denby to Triple Output—The Denby Motor Truck Co. is making plans for expansion which will triple the company's present capacity.

Will Promote Regal Sales—E. G. Crawford, formerly Ohio district manager for the Regal Motor Car Co., has been appointed sales promotion manager to succeed R. W. Donahue, who has resigned.

Will Reorganize Truck Company—The Hi-grade Motors Co. will be reorganized with a capital stock of \$250,000, all common stock, with Elmer Pratt as president. Mr. Pratt was formerly sales manager for the Pierce-Arrow company.

Myers Becomes Vice President—T. P. Myers has been elected vice-president of the General Engineering Co., maker of the Doble steam car. Mr. Myers joined the company the first of December, 1916, as sales manager of the truck department. He was made general sales manager about the first of the year and became director of the company the latter part of January.

Boston Doble Agency Placed—The Henley Kimball Co., Boston, Mass., has received the agency for the Doble steam car, made by the General Engineering Co., Detroit. The Boston company distributes the Hudson in Boston and eastern Massachusetts, and it is understood it will have the same territory for the Doble.

Service Managers Meet—The service managers or representatives of eight concerns met recently and adopted a universal service report and method of returning parts. An association was formed as the Equipment Service Association with D. W. Burke of the Westinghouse Electric & Mfg. Co. president, and R. A. Hall of the Electric Auto Lite Co., secretary and treasurer. The companies represented at the last meeting are: the Electric Auto Lite Co., Toledo, Ohio; the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.; the Bijur Motor Lighting Co., Hoboken, N. J.; the U. S. Light & Heat Corp., Niagara Falls, N. Y.; the Wagner Electric Mfg. Co., St. Louis, Mo.; the Dayton Engineering

Laboratories Co., Dayton, Ohio; Gray & Davis, Inc., Boston, Mass., and the ABC Starter Co., Detroit.

Anderson Leaves Maxwell—J. H. Anderson, assistant comptroller of the Maxwell Motor Co., Inc., has resigned to enter into other business in New York.

Opens Cincinnati Branch—The Michigan Oldsmobile Co. has opened a branch at Cincinnati, Ohio, with G. E. Scott manager of the wholesale business. The Herschede Motor Co. will handle the retail business.

Has Large February Business—The rim and tube division of the Standard Parts Corp., Cleveland, Ohio, experienced its largest February business last month, when it shipped 183,839 pieces of exhaust pipes and other tubular parts.

Hutchings with Saxon—W. J. Hutchings, who for several years has been packer and stock keeper for the Timken-Detroit Axle Co., has resigned his position to accept a position with the Saxon Motor Car Corp. and will be in charge of all stock departments.

King to Manage Dealer Department—C. H. King has been made manager of the new department for dealers in the Chalmers Motor Car Co. organization. This department will be an auxiliary to the sales division. Mr. King has been in charge of sales promotion.

Champion Turns Out 70,000 Daily—The Champion Spark Plug Co. now is turning out 70,000 complete spark plugs a day and has planned a total production of 20,000,000 plugs for 1917. A carload recently was shipped to Chanslor & Lyon Co., San Francisco, Cal., containing 149,000 complete plugs and porcelain. Other carloads have been shipped to Chicago and New England jobbers.

American Motors Elects—The American Motors Corp., Plainfield, N. J., has elected the following officers: President, William Howard Hoople; vice-president, Louis Chevrolet; secretary, P. W. Hansl; treasurer, George F. Baright. Joseph A. Carmody was appointed production manager in charge of the plant at Plainfield. Mr. Carmody formerly was chief engineer of the Wagner-Ward-Leonard Co. and construction engineer of the

General Electric Co. and has supervised the construction and installation of electric locomotives for the New York Central.

To Build an Addition—The Commerce Motor Car Co. will erect a new building four stories high, 100 ft. by 300 ft., next to its present factory buildings.

Spence Leaves Standard Tractor—G. B. Spence has resigned from the Standard Detroit Tractor Co., Detroit, to become sales manager of the Uni-Tractor Co., Chicago, maker of tractor attachments for Ford cars.

Ramey Gets Ever Ready Promotion—H. B. Ramey has been appointed sales manager of the storage battery division of the American Ever Ready Works, Long Island City, N. Y. Mr. Ramey was district manager of the storage battery division of the Chicago branch.

Buick Distributors at Headquarters—Representatives of the distributors of the Buick cars have been making headquarters lately at the Buick factory at Flint, Mich., where they meet the sub-dealers from surrounding territories who come in to drive their cars over the road.

To Make Cars in Utah—C. A. Cawley has constructed a motor car for which a company will be organized and which will be manufactured at Salt Lake City, Utah. The car is designed to meet western requirements and is of 41-hp., 4-cylinder and 5-passenger capacity. It will sell for \$985.

Edenburn Motor Editor at Detroit—W. D. Edenburn has become motor editor of the Detroit News and Sunday News Tribune. Mr. Edenburn is well known among the trade, having represented the A. A. A. contest board in Michigan for three years. He also has been connected with manufacture and sale of motor cars and for more than a year wrote motor car advertising.

Swinehart Issues Stock—The Swinehart Tire & Rubber Co. is offering its stockholders \$500,000 worth of 7 per cent cumulative preferred stock at par, which makes \$800,000 worth of one class stock now outstanding. Each stockholder is allowed to take proportions of five-eighths of the new issue to one share of the old stock held. The new preferred will be subject to conversion

at par into common stock at any time within the next five years. The common stock now pays 6 per cent.

Witters Joins Grossman Corp.—J. M. Witters has joined the Emil Grossman Mfg. Corp. and will represent its products in the Middle West.

W. H. Brown Joins Elgin—Will H. Brown, a pioneer in the motor car industry, has become director of sales for the Elgin Motor Car Corp., Chicago.

Buick Detroit Branch Appointments—Harold Klees has been appointed manager of the service department and J. T. Marshall has been made superintendent of the Detroit branch of the Buick Motor Co.

To Sell HAL in Utah—C. A. Quigley has been appointed HAL-twelve dealer at Salt Lake City, Utah, for that territory. Mr. Quigley is one of the old-time dealers at Salt Lake City and is handling the Chandler and Dort in addition to the HAL.

Arnsen to Duplex—Ludwig Arnsen, for four years sales manager of the Longuemare Carburetor Co., has been appointed Detroit representative of the Duplex Engine-Governor Co., Inc. He will represent the company in Michigan and Ohio.

Brown Goodrich Treasurer—L. D. Brown, cashier of the First-Second National Bank of Akron, Ohio, is resigning his position to become the treasurer of the B. F. Goodrich Co. He will succeed W. A. Means, who has become vice-president of the Goodrich company.

Oneida Production by April—The Oneida Motor Truck Co., Green Bay, Wis., organized with \$300,000 capital to build a motor truck, expects to start manufacturing operations by April 1. The company has been assured of deliveries of materials and parts so that the first trucks will be coming through by May 1. More than one-third of the contemplated production for 1917 has been sold.

Goodyear Purchases Fabric Mills—The proceeds of the recent stock issue of the Goodyear Tire & Rubber Co. will be used in part for the financing of a deal whereby the Goodyear company buys fabric mills in Connecticut. The fabric end of the business will be handled by a new corporation recently formed under the name of the Goodyear Tire & Fabric Co.

Gillette Safety Tire Expands—The Gillette Safety Tire Co., Eau Claire, Wis., which recently started manufacturing operations in its new plant, is preparing to establish a rubber reclaiming works, which will be the only one in the United States between Akron, Ohio, and the Pacific coast. A new building, 60 by 250 ft., will be erected. The daily output of tires has reached 200 casings and about 400 tubes.

Waldon Now Army Captain—Sidney D. Waldon, formerly vice-president of the Packard Motor Car Co., has been appointed captain of the aviation section of the United States army and signal officer in the reserve corps. Mr. Waldon left the motor car business to interest himself in the aero force of the United States army and to assist Howard E. Coffin on the naval consulting board and in national preparedness.

Burgess Battery Is Organized—The Burgess Battery Co., Madison, Wis., has been organized with a capital stock of \$200,000 by the members of the C. F. Burgess Laboratories, Inc., one of the largest chemical engineering concerns in the Middle West. The new company will manufacture electrochemical products, dry batteries, flashlights and accessories. The Burgess industries have just taken occupancy of a new fireproof plant. A branch plant will be established in Canada. The present force of 250 employees will be enlarged as expert help is available. The company controls its supply of raw materials, the manganese coming from a mine in Utah, whereas it formerly

was derived from the Russian fields. Officers of the new company are: President, C. F. Burgess; vice-president and sales manager, Duncan S. Keith; secretary, Ben S. Reynolds; treasurer, W. B. Schulte.

R. C. Durant to Leavitt Co.—R. Clifford Durant, son of W. C. Durant, president of the General Motors Co., has allied himself with the J. W. Leavitt Co. as one of the vice-presidents.

White to Manage USL Branch—C. E. White has been appointed manager of the Chicago branch of the U. S. Light & Heat Corp., Niagara Falls, N. Y. Mr. White was for several years manager of the Detroit Battery Co., Detroit.

McCulla in England—William R. McCulla, engineer for the Willys-Overland Co. and now under service orders of the English army, which he joined at the time of his trip to the war front for the Knox Tractor Co., has arrived in England and will leave soon for air service.

Fulton Truck Gives Metropolitan Agency—The Lawrence Motor Sales Corp., New York, has been appointed distributor for the Fulton motor truck in the Metropolitan district. Since the beginning of the year the truck production estimate for the year has been changed from 1000 to 2000.

Harding Leaves Prest-O-Lite—Jack Harding has resigned from the Prest-O-Lite Co., Indianapolis, Ind., to return to the Russel M. Seeds Co., advertising agent, as one of its two vice-presidents. Mr. Harding left the advertising company a few years ago to become promoter of sales for the Prest-O-Lite Co.

Establishes Export Department—The Crow-Elkhart Motor Car Co., Elkhart, Ind., has established an export department with Pierre Maas as export manager. Mr. Maas for eight years managed the export business of the Swift Co., Ltd., in England and also has been in the motor car business in Paris and Brussels and in the shipping trade in Antwerp.

Offers Stock to Public—The Ackerman Wheel Co., Cleveland, Ohio, is offering common stock to the public at par value of \$100 a share. The company is manufacturing a resilient wheel to be used with solid or cushioned tires or automatic tires, and claims that it is now working on orders from five different tractor planes for coast defense. The plant has a capacity of 100 wheels a day.

The officers are: A. H. Ackerman, president; M. M. Everhard, vice-president; H. P. Arnt, treasurer; D. D. Walker, secretary.

Cram to Empire Company—L. V. Cram, formerly engineer for Buick and later with Wheeler-Schebler, is now chief engineer of the Empire Automobile Co.

Edwards to Parker Rust Proof—G. D. Edwards, Jr., formerly with the Springfield Body Corp., has been appointed purchasing agent for the Parker Rust Proof Co.

Bissell to Detroit Steel Products—R. Bissell, for the last three years research engineer for Dodge Bros., Detroit, has joined the spring department of the Detroit Steel Products Co. in a similar position.

Stybestos Increases Floor Space—The Staybestos Mfg. Co., Germantown, Pa., maker of motor car brake linings, has increased its floor space 50 per cent and is installing machinery which will make it possible for it to accept additional orders for prompt shipment.

Stock Cars for Shipment—Daniel Bopp, Decatur, Ill., has adopted a novel method of beating the railway car famine annoyance. He has leased two stock cars and will keep them in service for six months between Decatur and the Reo factory at Lansing, Mich.

Perfex Radiator Expands—The Perfex Radiator Co., Racine, Wis., manufacturing radiators and cooling systems for passenger cars, trucks and tractors, has awarded contracts for a large addition to its plant, which was erected less than eighteen months ago and already has been outgrown.

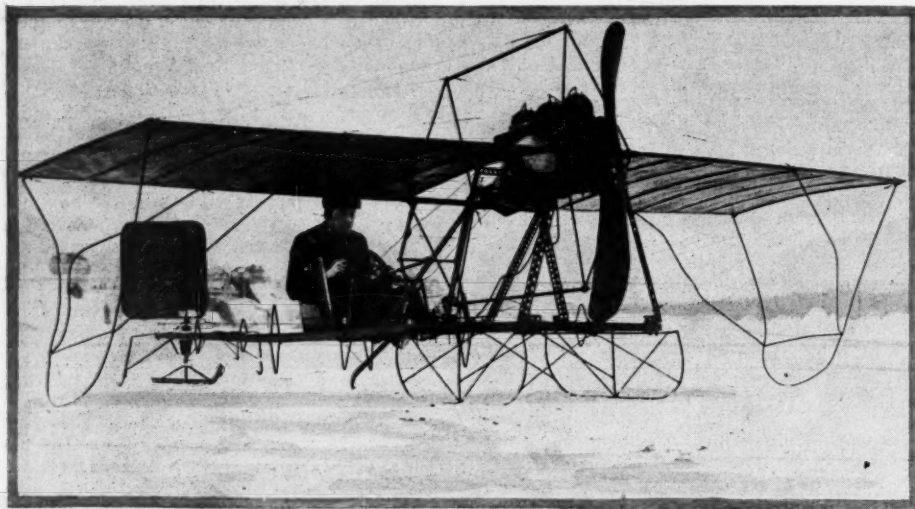
To Market Accessories—The Compradores, Inc., has been organized in Detroit to market motor car accessories and material. The concern represents the Prismolite Co., Indianapolis, Ind.; the Detroit Gauge & Metal Stamping Co., Detroit; the Fulton Greiter Carburetor Co., Cincinnati, Ohio; and the Detroit Motor Lock Co., Detroit.

Receiver for Reliance Engineering—F. D. Eaman of Detroit has been appointed receiver for the Reliance Engineering Co., Lansing, Mich. The concern has been doing a large business in the manufacture of motor car parts. The specific cause for the petition which was filed by F. L. Smith of Detroit, a large stockholder, was the company's failure to pay interest on bonds, of which \$550,000 are outstanding.



FOR HIM WHO WOULD HAVE A SPORT BODY ON HIS CAR—Here is shown the new Roamer car equipped with a sport type body

From the Four Winds



AEROPLANING WITH ONE FOOT ON THE GROUND—The March 8 issue, in which a sled driven by an aeroplane propeller was illustrated, calls forth another machine with wings on it. J. Hubert Stevens, Lake Placid, N. Y., has this one. At a speed of 45 m.p.h. the front part of the machine can be raised a foot off the ice. But the rear runner remains on the ice

CLUB to Reward Thief Catchers—The St. Louis Automobile Club has offered a reward of \$50 for the conviction of any person stealing a car belonging to a member of the club.

Garage Men Organize—The Moultrie County, Illinois, dealers and garage proprietors have organized the Moultrie County Garage Men's Association. Lack of uniformity in charges for repair work and supplies, price cutting and other evils are reasons for the move.

Danger of Potato Contracts—A Maine farmer contracted last fall to buy a Ford car and to pay for it March 1 with 400 barrels of potatoes. At that time potatoes were selling at \$1.15 a barrel, but today the cost of the car will be about \$3,400, if the original contract is carried out.

Clinton, Ill.—The De Witt County Automobile Dealers' Association was organized at a banquet attended by the dealers and garage men of De Witt County. It was pointed out that there was too much free service; too much allowed for used cars taken in exchange for new; failure to co-operate in checking up poor pay patrons; and, finally, lack of uniform prices in selling gasoline and other supplies.

Earth Road Wins Prize—Parma township in Ohio has won a \$100 prize offered by the Cleveland Automobile Club for the best maintained road in Cuyahoga county. The township invested \$1,300 in a motor tractor with which to haul its grader and used the grader throughout the year in shaping the roads whenever necessary. Road drags were used after rains, and special attention was given to the sides of the road. The brush was kept cut, the banks were trimmed, and some shrubs and flowering plants were set out.

Hartford Dealers Protest Law—That time tests out all problems has been forcibly brought home to motor car dealers in this city who have become aware of a section in the state law which confines the use of their cars under dealers' licenses to actual adjusting or testing demonstrations to prospective customers. The secretary of state has sent letters to the heads of all police departments in the state, calling attention to the fact that dealers' markers may be used only when cars are used in this way. Members of the Hartford Automobile Dealers' Association headed by S. A. Miner, Pierce-Arrow distributor, visited the secretary of state and stated their case. The committee

on roads, rivers and bridges is to consider the matter.

Colorado Highway Division to Meet—The Colorado division of the Pike's Peak Ocean-to-Ocean Highway Association will meet at

Coming Motor Events

CONTESTS —1917—

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|------------|-----------------------------------|
| March | 18—Pleasanton, Cal., track. |
| May | 10—Uniontown, Pa., speedway. |
| May | 19—New York, speedway. |
| * May | 30—Indianapolis, Ind., speedway. |
| May | 30—Walla Walla, Wash., track. |
| May | 30—Uniontown, Pa., speedway. |
| June | 9—Chicago, speedway. |
| June | 16—Kansas City, Mo., speedway. |
| June | 23—Cincinnati, Ohio, speedway. |
| July | 4—Visalia, Cal., road race. |
| July | 4—Spokane, Wash., track. |
| July | 4—Benton Harbor, Mich., track. |
| July | 4—Uniontown, Pa., speedway. |
| July | 4—Tacoma, Wash., speedway. |
| * July | 4—Omaha, Neb., speedway. |
| July | 15—Missoula, Mont., track. |
| July 17-19 | —Intercity Reliability. |
| July | 22—Anaconda, Mont., track. |
| July | 29—Great Falls, Mont., track. |
| Aug. | 4—Kansas City, Mo., speedway. |
| Aug. | 5—Billings, Mont., track. |
| * Sept. | 3—Cincinnati, Ohio, speedway. |
| Sept. | 6—Red Bank, N. J., track. |
| Sept. | 8—Pike's Peak, Colo., hill climb. |
| * Sept. | 15—Providence, R. I., speedway. |
| Sept. | 22—Allentown, Pa., track. |
| Sept. | 28—Trenton, N. J., track. |
| * Sept. | 29—New York, speedway. |
| Sept. | 30—Uniontown, Pa., speedway. |
| Oct. | 6—Kansas City, Mo., speedway. |
| Oct. | 6—Uniontown, Pa., speedway. |
| Oct. | 6—Danbury, Conn., track. |
| * Oct. | 13—Chicago, speedway. |
| Oct. | 13—Richmond, Va., track. |
| Oct. | 27—New York, speedway. |

* A. A. A. Championship Award Event.

SHOWS

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| March | 19-24—Paterson, N. J. |
| March | 19-24—Cedar Rapids, Iowa. |
| March | 20-25—Denver, Colo. |
| March | 21-24—Danville, Ill. |
| March | 21-24—Raleigh, N. C. |
| March | 21-24—Trenton, N. J. |
| March | 22-24—Mankato, Minn. |
| March | 27-31—Clinton, Iowa. |
| March | 27-31—Deadwood, S. D. |
| April | 4-7—Stockton, Cal. |

Colorado Springs, Colo., March 14 in annual session to consider ways and means for further development of the 550 miles of the highway that state contains.

Sends Speeder to Jail—A prison term without the alternative of a fine was imposed on a speeder who was a second offender in the traffic court in New York recently. Warnings had been sent out by the police department, and the defendant admitted that he had been going 26 m.p.h.

Canada to Hold Road Congress—The Fourth Canadian and International Good Roads Congress, held under the direction of the Dominion Good Roads Association, will be held at Ottawa, Ont., beginning April 10. The annual show of road machinery, materials and accessories will be held in conjunction with the congress.

Australian Speed Records Set—A Studebaker six driven by A. Jewell broke the Australian speed record for stock model cars with special racing bodies on the 11-mile hard sandy beach at Southport, Australia, recently. The mile was made in 44 sec. F. Z. Enger, driving an Overland four, was only $\frac{3}{4}$ sec. behind. Both cars made several trials under the auspices of the Queensland Automobile Club.

Mackinaw Indian Trail Organized—The Mackinaw Indian Trail Good Roads Club has been organized at Mackinaw, Ill., to promote a trail from Peoria to Bloomington by East Peoria, Groveland, Allentown, Mackinaw, Lilly, Woodruff, Danvers, Dry Grove and Twin Grove. The trail is the old state road and the shortest route between Peoria and Bloomington. The trail will be marked "Mackinaw Indian Trail, Peoria and Bloomington Short Line."

Philadelphia Clubs Fight Theft—Teamwork on the part of Philadelphia motor clubs has resulted in the imposition of heavier penalties on thieves. Recognizing that thefts are increasing weekly, these clubs hired G. Douglas Bartlett, a Philadelphia lawyer, to represent all members whose cars have been stolen. As a result thieves are being given sentences of from six months to two years. The clubs which have joined in this are the Automobile Club of Delaware County, the Physicians' Motor Club, Automobile Club of Philadelphia, Lu Lu Temple Auto Club, Quaker City Auto Club and the Germantown Automobile Club.